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Management Problems in Machine Building Industries

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Effect of the business cycle on management policies—Handicaps under which builder of production equipment must work—Profits of fat years must cover losses suffered in lean ones

THE JOB of managing almost any kind of business requires brains, but when the business consists of building and selling production equipment the requirement is particularly exacting. Commodities sold to the ultimate consumer can usually be induced to move faster if price concessions are made. The demand does not fluctuate widely. But when it comes to production equipment of any kind, —machine tools, textile machinery, printing machinery—the story is a different one. Building for stock in dull times is risky because of the danger of obsolescence. Price cuts have practically no effect on the market. Large buying takes place only in rapidly expanding markets. General business may be excellent, but if it is moving steadily at a high rate there may be little doing for the equipment manufacturer. Replacement business may be better at such a time but new business will be small if available facilities are adequate and no boom is in sight. The need for accurate information and careful study by men engaged in the equipment industries is obvious.

THE DEEP depression of 1921 got business men to thinking harder about the causes of such depressions than they ever did before. It is quite human not to bother much about the causes of business booms; most business men have the careless habit of thinking that a boom is quite the normal thing and a depression is an abnormal thing. During every depression in business, articles appear in business publications and economic journals ascribing the supposedly abnormal situation to various causes—mostly wrong.

Before 1913 Professor Wesley C. Mitchell, of Columbia, analyzed and classified the various theories of the whole sequence of prosperity and boom, crisis and depression. In his study of the many writers he did not find any one who had explained the whole sequence. Professor Mitchell brought these theories all together, subjected them to critical analysis in the light of statistics, and worked out a co-ordinated, logical explanation.

In the last chapter of Mitchell's monumental book, "Business Cycles," written in 1912 and printed in 1913, one can trace the business cycle that began with the depression of 1914 and ended with the depression of 1921, almost as though there had been no war at all. As a matter of fact the war merely accentuated different phases of that seven years' business cycle. Not many business men have read Mitchell's book; only a limited edition was printed and it was bought mostly by university and other libraries where it was read by students and professors. Prior to the war, opinions of economists were not considered as of much consequence to the business world.

The depression of 1921 spurred business men to inquire into the causes of the depression. This presented a psychological opportunity for economists and statisticians to impress the facts of the business cycle on business men. Articles printed in business papers, as well as in statistical and economic journals, show that some companies have now developed scientific bases for the management of their business according to the business cycle. Methods for guiding management policy to conform to the cycle are no longer a mystery. Even small concerns can make reasonable provision in their management policies for the fluctuations of business.

To do this properly every industry requires a few simple statistics, not at all difficult to procure when managers recognize their value. The United States Department of Commerce has issued a book "Trade Association Activities," that shows very concisely just about what statistics an industry ought to gather.

Some men think that general economic services like Harvard, Brookmire, Standard, Moody and Babson are

quite sufficient. They are valuable, but they are too general to be all that the business executive needs. No business man in his senses can expect broad generalities to cover his specific conditions, nor for that matter even his industry's conditions, because these are distinct from those of other industries. Each company in each industry has its own peculiar problem, because each company in each industry fits into the general machine of production in its own peculiar way. Some industries will run quite closely in accord with some of the composite curves of general business. Activities of other industries lead or lag such general curves very much If managers in these leading and lagging industries were to follow general curves blindly, they would put their business ships on the rocks by doing some things at some times that might be perfectly right to do in some other industry at those particular times.

The problem for business, therefore, is to study out the different factors operating in a specific industry, and show how those industries fit into the general picture. The best place to do this is through a trade association of the industry itself. The trade association thus becomes a bureau of economic research for the industry. As most losses in business have been caused by failure to recognize the cycle phases through which an industry passes, this function of economic research is an important one, often the most valuable one that a trade association can perform. The only method for pursuing such research is to gather the significant statistics an industry needs, to check these with those industries from whom it buys, or to whom it sells.

Equipment and machine making industries fluctuate more violently than others, for causes now well understood. The fluctuations of shipments for 29 representative machine tool companies is presented in Fig. 1. This chart is typical of many other equipment industries. It probably shows greater fluctuations than almost any other equipment industry, because the machine tool industry equips other machine builders. Based on the number of machines shipped, it represents physical quantities and not dollar values. It is reduced to an index of 1913 to tie in with the Department of Commerce indexes of other industries.

To get a picture of the machine tool industry compared to another traditionally irregular industry, the movements were reduced to a percentage deviation from the trend or line of growth, shown by the figures for 14 years from 1901 to 1914 inclusive. Pig-iron production by years was likewise reduced to percentages of deviation from trend, and the two are plotted together as shown in Fig. 2.

The "feast and famine" character of the iron industry is widely known. This chart shows that the machine tool industry has greater fluctuations than the iron industry. These charts bring out clearly and strongly

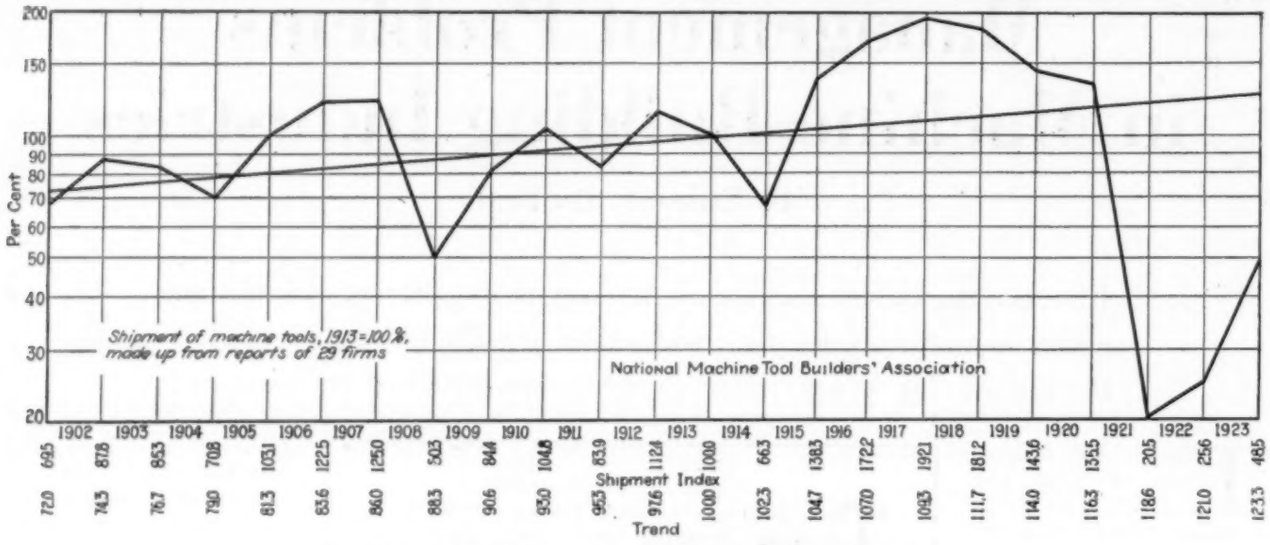


Fig. 1—Fluctuations of the machine tool industry

the comparative irregularity, which must be reckoned with in successful management.

Blind management conceives of normal production as corresponding steadily to full capacity of plant. A blind management hastens to build plants to care for an increase in demand, without knowing whether that increase is temporary, or is according to a well-determined trend that would make it permanent. In this way blind management wastefully increases capacity, and thereon sets a new level for its dream of normal.

In equipment industries it is often suicidal, and is always foolish, to dream of continuous full-time operation at full capacity. But no one can fully recognize this folly until it is proved by facts. Only by cooperation among participants in an industry could one compile such figures as those on which these two index charts are based. Many who give the subject little thought consider gathering such facts as merely cranky notions. Yet precisely such facts as these were required before men could believe that their industry does run in cycles, and that these cycles are not identical or regular, either in length of time or in range of fluctuation. Once these facts are grasped men recognize that their managerial problem is complicated and not simple. They then recognize the need of greater study to meet the conditions that are so puzzling when facts are not available for their explanation.

As typical of the problems for any maker of industrial machinery, let us consider the problems of a manager of a machine tool shop, compared with those of a blast furnace manager. A pig of iron is staple in its essential utility and retains its chemical and physical character regardless of business conditions. Its price varies but its inherent utility is constant.

The manager of a blast furnace has his operating

troubles, of course. He cannot tell today just exactly what kind of iron will come out of the spout of his furnace tomorrow, because varying conditions develop inside the blast furnace that make it impossible to duplicate the same run of iron from day to day. But when it does come out, its essential character is retained and is always salable at a price, low or high.

On the other hand, the machine of today's design and construction is apt to lose its utility, because the march of invention is always changing things that are essential in machines. Every machine builder must be continually improving his product, or he is passed in the race by a more progressive rival. This progressive obsolescence of design destroys the utility of old types, and consequently their value.

Stocking pig iron presents some difficulties. A furnace company may strain its financial limit by continuing operations too long on a falling demand. There are physical difficulties in stocking pig iron, due to the necessity of segregating furnace lots according to their analyses. These difficulties make the stocking of iron stop as financial and physical limits are reached. The same difficulties apply to the machine builder, but beyond and in addition to these, is obsolescence of design that makes it very risky, indeed, to stock very far ahead of demand, and makes it necessary to run closer to demand. This means that machine building plants are "peak load plants," and have what the electric power people call a bad "load factor."

The labor force of a blast furnace is largely composed of comparatively unskilled labor, presenting relatively simple problems in training and recruiting. The labor force of a machine shop consists very largely of highly skilled mechanics, whose training must be long and costly.

Recruiting labor is particularly difficult for a machine tool builder at the time when most needed. The demand for machine tools comes on rather late in a business cycle, and it goes off rather early, considerably before the crest of the demand for products of machine tools. The labor used in building machine tools is the same as that employed by the buyer of the machine tools. The machine tool builder finds his labor market swept pretty clean by his own customers, before they put in many orders for machinery, making it that much more difficult for the machine tool builder to satisfy his customer's insistence on delivery. Similarly with material. The machine tool builder has to throw his belated demand on the material market long after his customers have booked their requirements, and he suffers most from delayed deliveries and unfilled promises.

No machine tool builder can easily forecast his own requirements for additional plant facilities. Individual rate of growth depends largely on the relative merits of his designs as compared to those of his competitors. Although he may be going strong, his competitors may bring out better designs, that turn business away from him. This makes forecasting of an individual's rate of growth an extremely difficult problem. It is impossible for any machine builder to lay out a construction policy to the same advantage as can be done in industries with a more stable demand. As a consequence production facilities are heavily taxed at the peak of demand, simply because a new design in advance of competitive designs throws an unforeseen load on the plant. Then construction must be undertaken at the highest costs to supply the demand.

In view of all these difficulties the question naturally arises, "Is this condition of irregularity so unavoidable that the machine builders must simply take things as they come and ride the business waves up and down as they develop?" There are inherent reasons for irregularity in demand for equipment of all kinds. By purely logical analysis, economists developed these reasons before there was much statistical material available from which they could draw the same conclusions. The existence of this irregularity and some of the reasons for it were brought out by George H. Hull in a book printed in 1911, entitled "Industrial Depressions."

An analytical explanation of these conditions was brought out in March, 1917, in the *Journal of Political Economy*, in an article by J. Maurice Clark, entitled "Business Acceleration and the Law of Demand." The report of President Harding's Conference on Unemployment, dealing with "Unemployment and Business Cycles," also shows why equipment industries are necessarily more irregular than industries making consumers' goods. This being so, it is the business of managers in the machine industries to conform their policies to these facts, or suffer the consequences of attempts to operate contrary to conditions.

Mr. Clark pointed out that equipment is bought for one of two needs; for replacement of old equipment, or for expansion of industries that have an increasing demand for the product of the equipment in question. The amount of replacement demand for equipment varies roughly with the amount of finished product made,

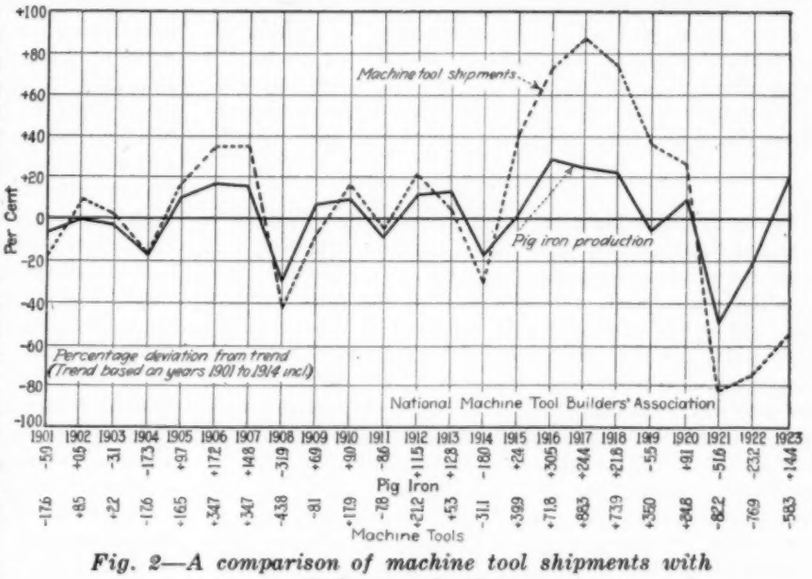


Fig. 2—A comparison of machine tool shipments with pig-iron production

but the amount of expansion demand depends on the *rate* at which demand for finished product is *growing*. Thus demand for machine tools from automobile factories shrinks, not from shrinkage in the production of automobiles, but from slackening in the rate of growth of the automobile shops.

Tremendous pressure was put on machine tool builders in the years 1915, 1916 and 1917, because of the rate of growth of war demands. As the chart shows,

machine tool shipments fell off in 1918 though in that year the rate of production of war munitions was accelerated. Even the replacement demand fluctuates more than actual wear-out, because when business is dull men will not buy necessary replacements as readily as when business is active. Mr. Clark says, "Making all due allowances for mitigating factors, it is difficult to see how the machine-making industries can possibly avoid the disagreeable experience of outgrowing themselves in times of prosperity. For demand can never be expected to grow at an absolutely steady rate, and the slightest fluctuation seems destined to put the producer of capital goods in a situation like that of a passenger forcibly carried by his station."

The charts show how this acceleration affected 29 companies for 23 years. They show how the boom of 1906 and 1907 was followed by 7 years of much slower demand, with shipments far below the capacity made available in the boom years. How much the machine tool industry's war capacity outgrew reasonable peacetime demand will only be known after many years.

In a book printed in 1923 entitled "Economics of Overhead Costs," Professor Clark shows the various effects of excess capacity. Unutilized capacity is a continuing liability even though book figures carry it as an asset. Whether a manager realizes this or not, excess capacity whittles down his profits. The wise manager takes steps to utilize it, or he sells it off. But selling off those new bays added to the old shop is not easy. Utilization will come by bringing out some new product that will fill a demand. The inventive type mind will create some market with revolutionary designs of machine tools. Perhaps this will be at the expense of less inventive competitors whose capacity will become an increasing burden to them, and finally put them out of the running through bankruptcy. The commercial type of mind will utilize some capacity by taking on some other product, not machine tools, as the answer to the problem of continuing expense. The financial type will combine with others, concentrate manufacture in fewer shops and turn the excess plants into cash by sale.

Demand is Seldom Constant

There are few industries, if any, whose demand is constant year in and year out. Machine building can never be numbered among these few. Whether they run steadily or run with wide fluctuations, machine builders must get enough in price over a period of years to keep them going, or they are stopped by failure. The progress of society in material well-being depends largely on the machine building industries whose inventive brains have multiplied human muscle power through transfer of skill and intelligence from men to machines. To get the machines, society has paid all the costs, sensible and otherwise, of producing them. When men fail in business their investment loss and their debts come from surplus previously accumulated by them and their creditors, so society has paid for these losses as well.

Users of machines must pay enough to keep the builders alive, though idle during certain times, in order to get machines when wanted at other times. The necessity of irregular operation means that large reserves must be accumulated to carry the organization and plant through depression, ready to serve customers when they again require machinery. Unwise business men, unwise accountants, and unwise tax laws falsely call this profit, but the economist and the sensible business man know that it is a necessary cost. It can be collected only in the price of the product sold in times of activity. It must, and will, be spent in times of inactivity, whether previously collected or not. If not provided for in price and maintained as reserves it simply comes out of the owners' capital or creditors' capital when depression comes. Then it shows up in the loss account, where the accountant can't miss it, but where neither accountant nor tax gatherer recognizes it for what it really is —a true production cost. But as a loss, it is paid by someone other than the buyer of machinery; it is paid by bankrupt machine builders and their creditors. These facts hold lessons for managers of all shops making industrial machinery.

Failures Among Machine Builders

Statistics of failures during the worst of the last depression show that failures were far more common among the machine making industries than among any other class of manufacturers. Was this not due to the fact that so many machine shops are operated by men of the inventive or production type of mind, rather than by men of the commercial and financial types?

It is quite human for the production man to pay scant attention to the business factors that must be successfully reckoned with, if his shop is to keep on going. Knowing little of these things, such men frequently do not finance their business on a sound basis to begin with, and fail to keep their finances sound after operations are started. The necessity for liquid cash reserves makes it very unwise to try to finance machine building companies of any kind on a shoestring. If bankers would only recognize that fact and refuse excess credit to machine builders who have too little capital, the failure rate would be much lower, and that much social waste would be saved.

Too often the shop man's ideas of price do not include adequate provision against overhead items. He knows little of depreciation, obsolescence and cyclical idleness that must be covered by the selling price if his business is to continue. Such a man is a danger to his stockholders and to his better informed competitors. Many a man of the mechanical type goes peddling his brains for pennies when he could just as easily get dollars. Men have proudly and truthfully told users that their machines pay for themselves in three or four months, or a year—in other words that they are offering investments that yield from 100 per cent to 300 per cent per year in income. Every sensible buyer wants machines that turn out good product in a short time at a low labor cost. When he buys such a machine he really invests in earning power. He does not hope to buy a whole plant on a 100 per cent per annum income basis. That is too good to be true, and he knows it.

When offered a machine that really shows such earnings he knows he has found a bargain, but it is shrewd tactics to keep his discovery to himself, and to keep an unbusinesslike machine builder from asking as much as his machine is really worth. A man trained along mechanical rather than sales lines is easily misled by these tactics. He thinks that cost of production is the basis of price. He does not realize that if he were foolish enough to make a machine that costs more to produce than it was worth to the user, he could never sell it at a price that equaled its cost. As the buyer would soon show that cost had no connection with value in that case, so the seller should know that cost does not make value at any other time.

Many men whose inventive brains contribute much to

the progress of society do not study business factors enough to collect what society is perfectly willing to pay them. Failure to do this prevents them from further adding to the progress of humanity by further development. Of course they are victims of their own ignorance, but it is part of their job to know how to be good merchants and financial men as well as good inventors and manufacturers. Failure at any part of their job brings its penalties from which there is no escape. The penalties are not visited on the culprits alone but on all others with whom they compete, and on all humanity as well, by keeping the machine industries poor in comparison, and thereby limiting their development.

In 1919 the Census of Manufacturers reported value of product per wage earner in all industries as $6,862. For the iron and steel products group, excluding tonnage products made in steel works and blast furnaces, the product was $4,922 per wage earner. Deducting wages and material, the residue for overhead, salaries, taxes and profit per wage earner was $1,538 in all industries, while the mechanical group reported $1,524.

Determining Value by Formula

Now taking into consideration the character of plant and the designing and engineering ability required, it would seem reasonable to expect this residue in this group to be somewhat larger than the average. Do these census figures show in a broad way for the metal workers, what the failure statistics show, that the metal worker is a poorer business man than the average manufacturer? A committee of the Material Handling Section of the American Society of Mechanical Engineers have done a real service to all equipment industries by working out formulas that can be used by buyers and sellers of equipment. They were published in the September issue of *Mechanical Engineering*. These formulas show a true gage of the utility of a machine as measured by its labor-saving power, as offset against all costs of operation. They take all the measurable business factors into account and show the permissible investment compared to the price asked. By good salesmanship all machine builders can get prices that are close to the permissible investment, in cases where patents protect the price. Even where the sale is competitive, the returns can be improved.

Every machine salesman should be trained in their use, and every machine builder should use them before pricing his production machinery. Suppose one found with these formulas that the investment of $10,000 would return 30 per cent or 40 per cent per year to the user. Certainly the machine builder could not be accused of profiteering if he nerved himself to ask $10,000 for the equipment and in that price have a margin against the risks he incurs.

It is true that if the machine builder does collect an allowance for the cost of cyclical idleness, the tax gatherer will call it profit and take toll of it. Even that does not make it profit, but does make it necessary to add the additional toll into the price, to be sure to collect the net cost.

When machine builders study the financial and commercial sides of their business as hard as they have the designing and production sides, machine shops will not head Dun's list of failures as they have. Machine builders' brains produce machines that advance the civilization of the world. Machine building will produce as much profit as other industries produce when machine builders apply their brains to problems of the balance sheet as well as to those of the drawing board.

The Application of Spiral Bevel Gears

By F. E. McMullen

IT IS noticeable that curved tooth gears are being applied to a greater extent as their qualities of operation become more familiar. Spiral bevel gears which bear the same relation to bevel gearing that helical gears do to spur gearing, have been commercially available for the past ten years, a time sufficient to provide information from which we can draw practical conclusions regarding their application.

There is naturally a great similarity between helical spurs and spiral bevels in that there is the same continuity of pitch line contact, axial thrust and proportionately greater strength, all of which insure quiet and durable operation when properly designed, made and mounted.

The axial thrust produced by the operation of spiral bevels must be fully taken care of when mounting the gears and failure to do so can only result in poor performance or life of the gear. The importance of this point cannot be overstressed for a strong, inflexible mounting is an insurance for almost unlimited life of a well designed set of case hardened gears. A point to consider in bevel gears is that it is seldom possible to mount both members of a pair between supporting bearings.

What Happens When Gears Are Displaced

The effect of displacement of gears in the mounting when working under load can be readily observed on the tooth contact. When a set of bevel gears is displaced from their proper running position the tooth contact is shortened lengthwise and is located near the top of the tooth. In bad cases the load becomes concentrated on the top corner of the tooth at the large end. There can be little question why spiral bevel gears operating in such abnormal fashion are noisy and break. For the continuity of pitch line contact—the main virtue which induces quiet operation—is lost and the operating load is concentrated on a small area rather than distributed across the tooth as it should be.

In spite of the lack of proper mounting in many cases spiral bevels have stood up due to their inherent characteristic of suffering a greater displacement than straight bevels before grievous results are evidenced. Where the pinion movement on say a 5:1 ratio, 5 pitch installation should be limited to 0.004 in. we have found as much as 0.065 in. separation of gear and pinion along the axis of the pinion, an impossible condition for which to make gears. Theoretically, a pair of bevels has no adjustment, which is the term applied to ability to withstand displacement, and while spiral bevel gears cut by the Gleason method possess the adjustment quality, it is a limited quality which cannot be abused. In helical spurs any axial separation of a pair of gears merely shortens the lengthwise bearing but does not produce faulty tooth contact.

There are four distinct qualities which characterize spiral bevels from straight bevels; quiet operation at high speeds; a higher degree of smooth action at low speeds; greater proportional strength; cheaper quantity production. The adoption of a spiral bevel gear drive is often decided upon by one or more of these qualities.

Paper presented at Buffalo meeting of American Gear Manufacturers Association, April 28-30, 1924.

The first general adoption has been in the automotive field where the refining development in attaining quiet motors has in turn demanded silent transmissions and rear axles. Strength has also been a large factor for the conservative estimate of 30 per cent greater proportional strength has removed the source of trouble caused by breakage in many cases or permitted a reduction in size with its consequent lessening of the unsprung weight. The costs have been lowered, both from a strictly gear production standpoint and also the intangible costs of assembly induced by less teardowns and re-adjustments.

There are many other uses—forty-seven distinct applications in all—among them, the sewing machine where their silent operation at high rotative speeds has recommended them for household use. In a stocking knitter machine where the needles had to be swung out of the way to load the machine—600 needles was formerly the maximum that could be used since the gear swung out of mesh from its driving mate and in executing this movement there was a slight rotation which, if carried too far, would shear the thread off. We evolved a design of gear in which the tooth had a radius struck from the center of oscillation of the needle head and this caused so little disturbance in the machine setting that the number of needles was increased to 900.

Another interesting use is in the co-planar microscope, where two refracting lenses must be perfectly synchronized at all times and be capable of smooth adjustment. These gears, made of German Silver, are quite small—48 pitch—and their extreme tolerance of run-out is 0.0002 in. with no backlash permitted.

Common uses include phonographs, ice cutting machinery, centrifugal dryers, vacuum cleaners, overhead camshaft drives—both on automobiles and Diesel engines, washing machines, grinders, motor reduction sets and machine tools. From the number of experimental installations now under way, it appears that the use of straight tooth bevels will be limited to slow moving drives where smoothness is not essential.

A Simple Fixture for Testing Belting

SPECIAL CORRESPONDENCE

If an attempt is to be made to measure the tensile strength of belting by holding the specimen in the wedge grips of the testing machine, the great pressure of the grips usually crushes the specimen, causing it to fail along the edge of the grips and at a low load. If special fixtures are to be made, the design shown in the accompanying illustration is suggested because it is both cheap and effective. Most of the material was obtained from the scrap pile and the design is so simple that almost anyone can make a similar one with little trouble or expense.

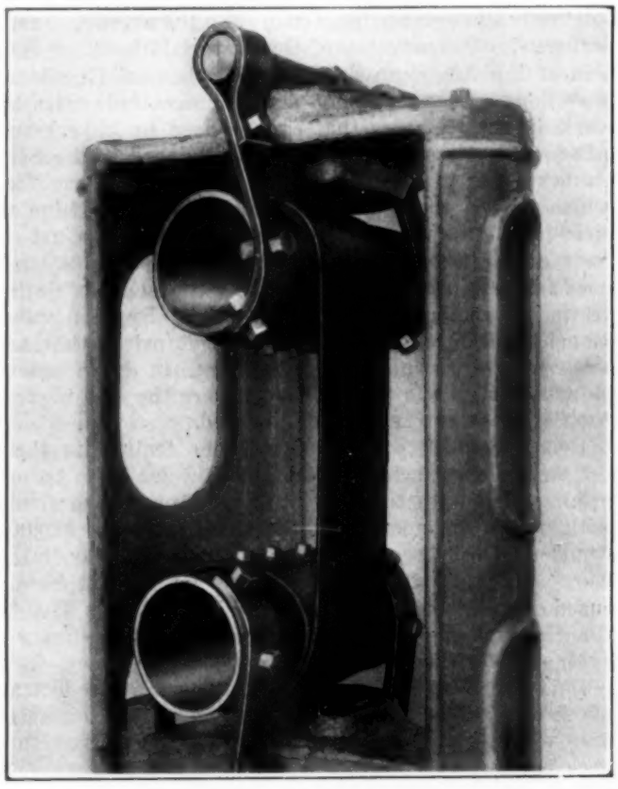
Owing to the fact that the specimen is wrapped around the cylinders, which should be as large as practicable, a part of the load is carried by friction and the remainder by the clamps near the ends of the specimen. These clamps cover about one-quarter of the circumference of the cylinder, each one is fastened by eight capscrews and, where necessary, holes for the screws are cut in the specimen. It was found convenient to use the straps for the widest belt in testing the narrower ones also, but care was taken to avoid crushing the belt. This might occur if all the capscrews were tightened, as would be necessary for a wide belt.

LOAD ON CLAMP IS SMALL

That the load carried by the clamp is small is seen by reference to Maurer's "Technical Mechanics," page 84, or to almost any test-book on engineering mechanics. If we assume that the coefficient of friction is one-quarter and that the specimen is wrapped around the cylinder for seven-tenths of the circumference, then the load on the specimen at the clamp is only one-third of the load measured by the testing machine.

No tests were made to determine the effect on the apparent strength of the belting caused by varying the diameter of the cylinder. It is believed, however, that the apparent strength will be reduced as the cylinders become smaller, and in writing specifications for the purchase of belting, therefore, it would be advisable to give the diameter of the cylinders to be used in making the tests.

As the cylinders are always parallel, care must be used in fastening the specimen to obtain a uniform stress across the belt as the load is applied. All the specimens tested in this fixture broke in the twenty-inch free length between the two cylinders. Failure occurred suddenly across the entire width, showing that stress was uniform.



Fixture for testing belting

A fixture of this kind can be used for testing the strength of rope, canvas, and other fabrics as well as leather belting.

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The Master Tools of Industry

By Dexter S. Kimball
Dean of Engineering, Cornell University; Past President, American Society of Mechanical Engineers

Henry Maudsley and his enduring contribution to lathe design —Beginnings of interchangeable manufacture—The semi-automatic machine — Spencer and the full automatic machine

THE next great step in the development of the lathe was to make the work rotate continuously in one direction as shown by the lathe in Fig. 11. The difficulty encountered in translating reciprocating motion into motion of rotation appears needless to us today, yet the curious "kicker" that engages the crank pin shows this to have been a real problem. In the lathe owned by the famous English mathematician and economist Charles Babbage, Fig. 12, the modern solution of this simple problem appears in the form of the well-known "connecting rod." Obviously, this improvement made turning an easier matter, but still a considerable degree of skill was necessary to produce, say, a true cylinder of a given size with a machine such as Babbage's. The foot power lathe persisted in manufacturing circles for a long time, in fact it still survives.

The need of the new industrial day, however, quickly set mechanics thinking about other ways of improving the lathe and this impetus produced some very remarkable mechanics, any account of which is beyond the limits of this article. Foremost among them stands Henry Maudslay who, near the end of the eighteenth century, made the next great step in transfer of skill in connection with the construction of certain small lathes, two models of which are preserved in the Kensington Museum and one of which is illustrated in Fig. 13. Maudslay machined the edges of the lathe bed and fitted a sliding member to these surfaces, this sliding surface carrying a tool holder as in all modern lathes, and moving parallel to the center line of the work. He also arranged a lead screw so that the saddle would travel automatically at a fixed rate of speed as compared to the rotative speed of the work. Further more, he provided change gears so that the speed at which the tool advanced could be varied and, as a consequence, screws of various pitches could be cut. In fact he constructed the first modern lathe. The most important step, however, was the accurate guiding of the cutting tool by means of the sliding saddle. A much less degree of skill was necessary to turn a given form with this guided tool than with hand tools using the old form of lathe. It was a most important transfer of skill and all modern standard lathes embody Maudslay's principles of construction.

Progress during the first half of the nineteenth century was not as rapid as would naturally be expected. In 1862 a great exhibition was held in Vienna which included a display of machine tools. Figure 14 shows a lathe exhibited there by the famous tool maker Joseph Whitworth which embodies many of the features of our modern machines. But again, Fig. 15 shows a foot-driven lathe which looks hopelessly inadequate despite the fact that steam power had come into extended use by that time. From that time on, progress appears to have been very rapid and some years before the end of the century lathes and other machine tools

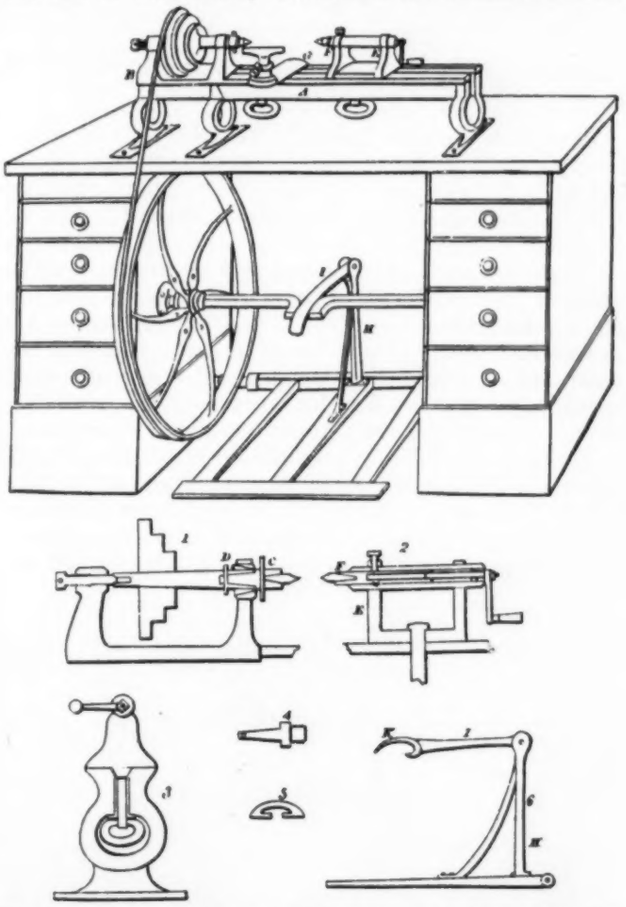


Fig. 11—One of the early lathes in which the spindle rotates constantly in the same direction. Note the curious mechanism for translating the reciprocating motion of the foot into the rotation motion of the crankshaft

of great capacity had become common. Fig. 16 shows an ordinary engine lathe as made about 25 years ago. The modern lathe shown in Fig. 17 differs from Maudslay's little machine in complexity, but not in general principles and the great lathe shown in Fig. 18 marks the progress of one hundred years, a greater development in our tools of production than had been accomplished during all the years of man's history.

Concluded from p. 683, Vol. 60, No. 19.

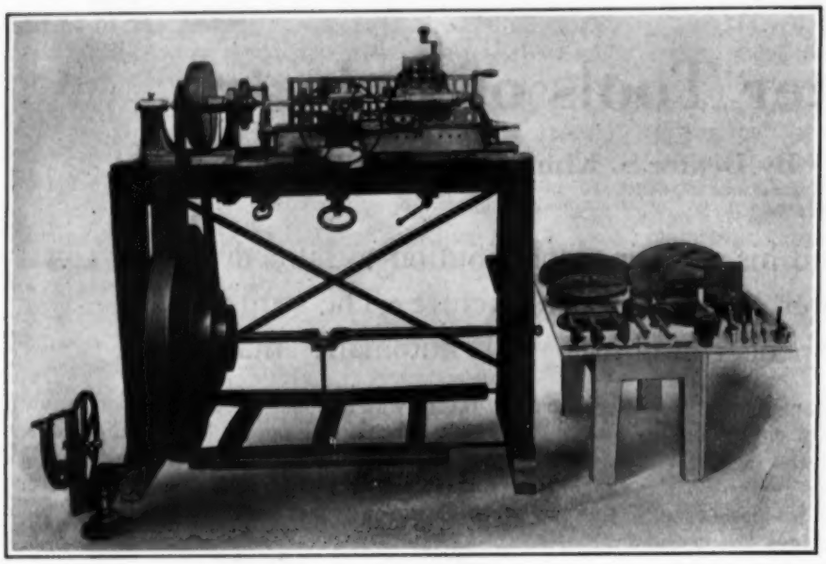


Fig. 12—A lathe that was the property of Babbage, the famous English mathematician and economist

Even with the most highly developed lathe of modern construction a high degree of skill is still required on the part of the operator for most work. Both skill and time are required simply to set and adjust the cutting tools and in repetitive operations this may consume a large part of the total time required to produce a given machine part. Repetitive operations in such numbers as to constitute any semblance to mass production appeared first in the United States in connection with the manufacture of fire arms though English mechanics had encountered this problem long before in the manufacture of "blocks" for the rigging of ships.

As early as 1808 Brunel, a celebrated English inventor, had designed and built with Maudslay's aid a complete set of semi-automatic machines for the Portsmouth Navy Yard for the manufacture of ships blocks, which have become historic. The production of fire arms, however, raised another important consideration namely, "interchangeable" manufacturing since it is highly desirable in such product that all parts shall be closely alike. Out of this development grew, among other important advances, the modern turret lathe, usually attributed to the work of Henry Stone, though there is reasonable doubt as to the fairness of this claim. Professor Joseph W. Roe in his interesting book, "English and American Tool Builders," writes, "Probably no machine has had so great an influence on interchangeable manufacture as the turret lathe. The turret lathe, the first radical improvement on Maudslay's slide rest, was built commercially by Robbins and Lawrence in 1854 and is said to have grown out of a revolving-head bolt cutter which Henry S. Stone saw at Hartford. The turret idea was not originated by Stone." Probably like most inventions the turret was the

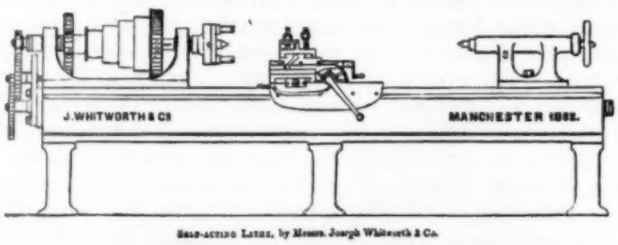


Fig. 14—A lathe exhibited by Whitworth, the famous English tool builder, in Vienna in 1862

work of many minds, but it appears clear that the turret lathe, as we understand it, was manufactured commercially by Robbins and Lawrence at Windsor, Vt., as early as 1854 and that Stone at that time was the designer for the company. Fig. 19 illustrates Stone's orginal drawing for the turret as first applied to the lathe by Robbins and Lawrence and Fig. 20 shows one of the very early turret lathes made by this company. The development of this important tool in the hands of this company and its successors and particularly the development by one of its lineal descendants, the Jones and Lamson Co., under the able leadership of James Hartness, is too well known to necessitate discussion. One of the first Hartness flat turret lathes is shown in Fig. 21. It was built in 1896.

The importance of the turret lathe rests upon the great degree of transfer of skill that it embodies. In it the tools are set and adjusted once for all by a skilled mechanic and then almost anyone can do the work of production, even when the most complicated parts are to be produced. And whereas it may be difficult for a skilled worker to

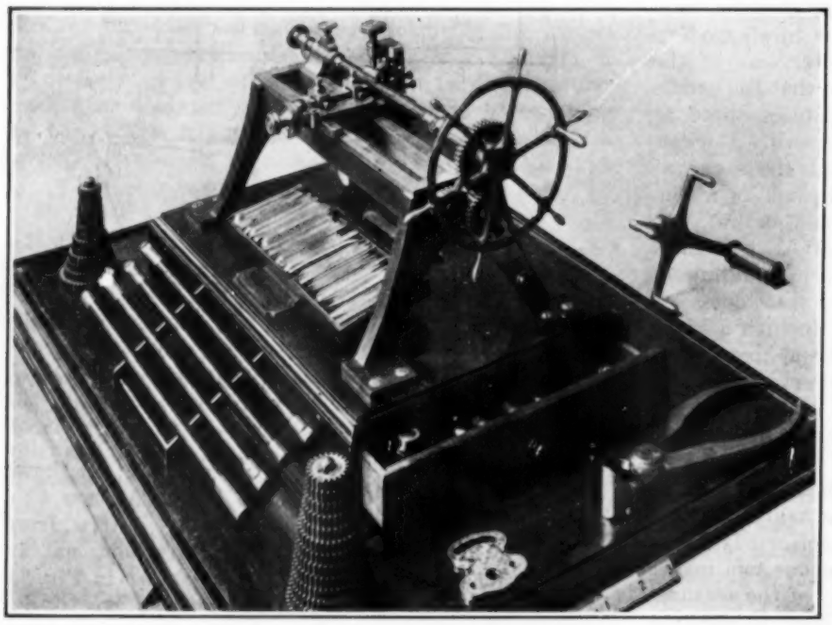


Fig. 13—One of Maudslay's first lathes. While small in size it practically embodies the most important principles of all modern lathes

produce a given piece on the standard lathe with accuracy, it is as difficult for the unskilled operator to produce the same part in an inaccurate manner on the turret lathe, if the tools are properly set. In many

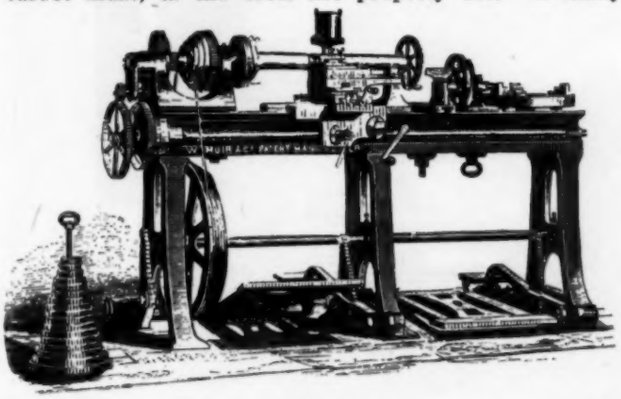


Fig. 15—A lathe exhibited by Muir and Company at Vienna in 1862. Note the foot power gear still in use though the steam engine was well developed by that time

respects this tool corresponds to Hargreaves' spinning machine. It marks the stage of development in the lathe where the worker becomes an adjunct to the tool. It belong to the class of tools commonly known as "semi-automatics."

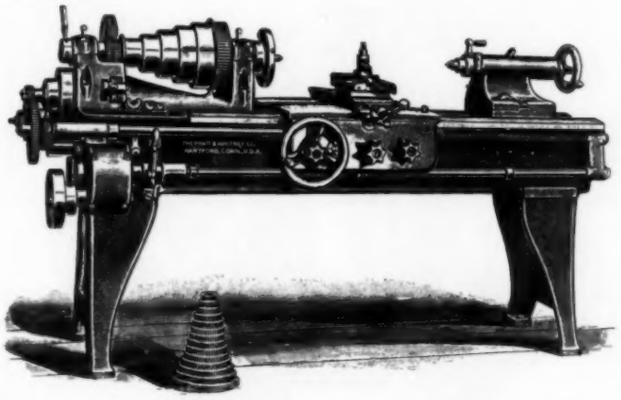


Fig. 16—An ordinary engine lathe in use twenty-five years ago

In operating practically all semi-automatic machinery a small amount of skill and a considerable amount of intelligence are required on the part of the operator. Even though a large degree of transfer of skill has been embodied in the machine there must be intelligent direction of its operations. The manufacture of fire arms incident to the Civil War gave a great impetus to the development of manufacturing methods and shortly after the close of that war Christopher Miner Spencer made the next great step in the development of the lathe by making it fully automatic. Spencer's invention was essentially a cam cylinder, rotating in synchronism with the main spindle, on which can be bolted adjustable

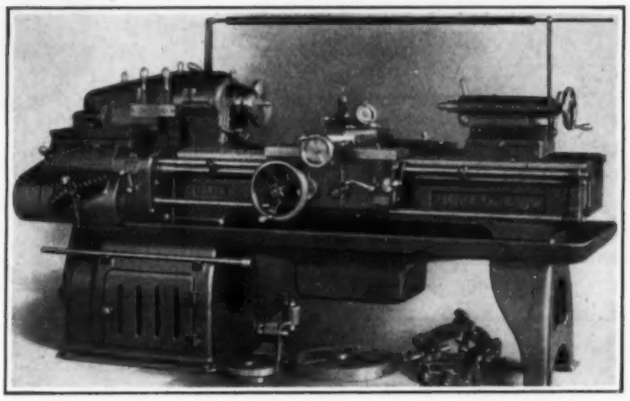


Fig. 17—A modern motor-driven lathe of moderate size

cams that will give any desired sequence of motions to the turret. This "brain wheel," as it has been called, can be readily seen in Fig. 22. Such a machine embodies not only transfer of skill but also "transfer of intelligence" and the automatic screw machine in its highest form as illustrated in modern machines, Fig. 23, is one of the most highly developed of man's productions in this line. Maudslay's slide rest, Stone's turret and Spencer's cam wheel are basic features of nearly all modern automatic machinery. Fig. 24 shows a modern automatic drilling machine and the machine industry abounds with similar applications of these basic principles. It is unfortunate that space does not permit the showing of more examples.

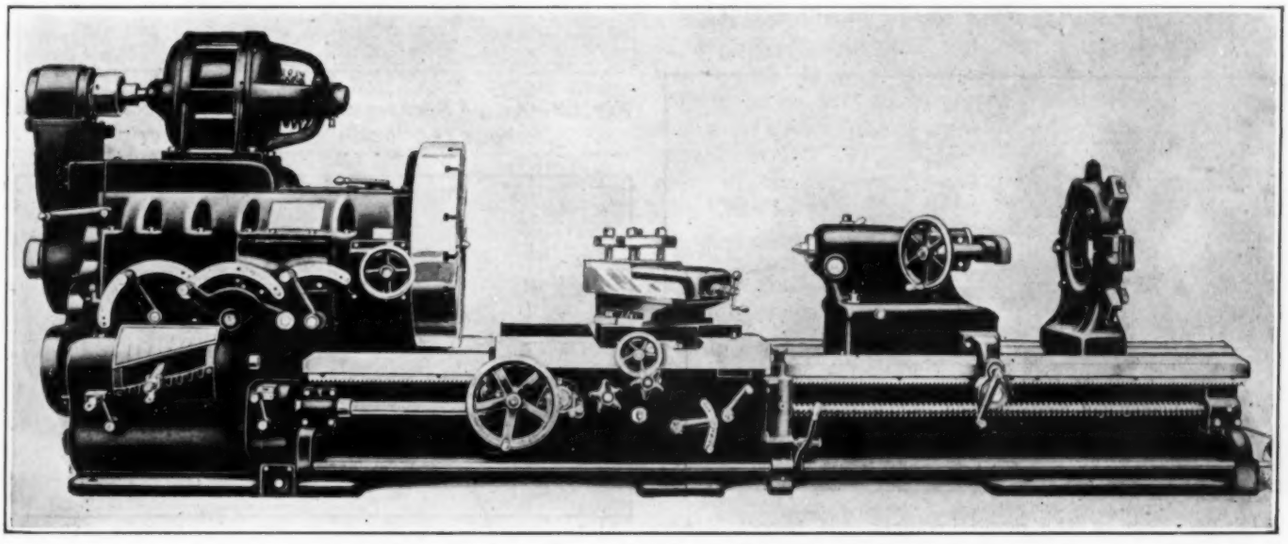


Fig. 18—A lathe of 36-in. swing built in 1924

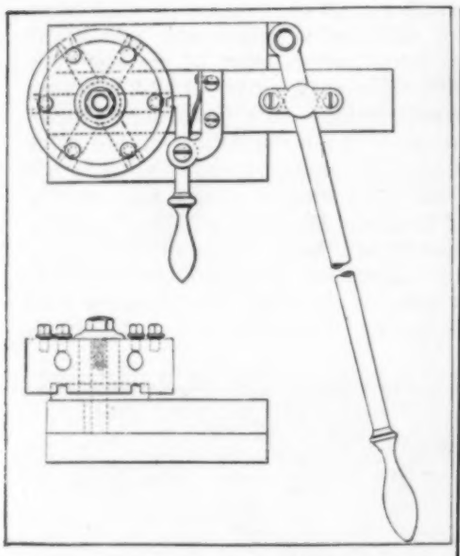


Fig. 19—Original drawing of Henry Stone's turret

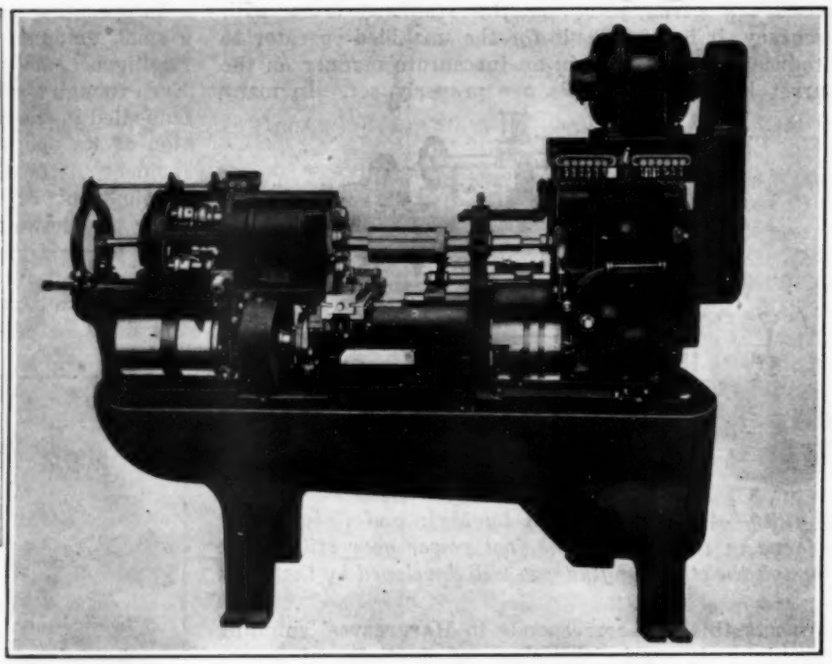


Fig. 23—A modern automatic screw machine

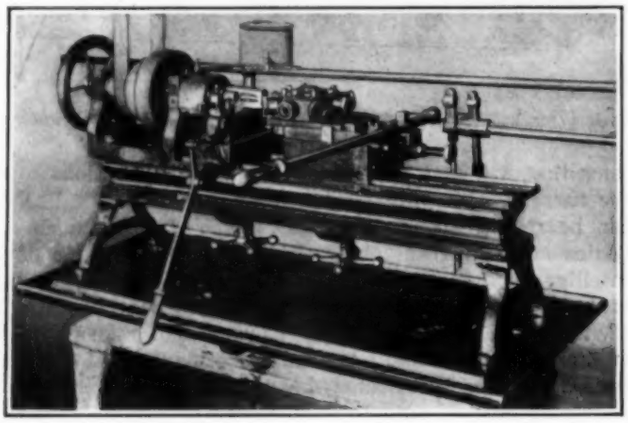


Fig. 20—One of the first turret lathes ever built. "Revolving head screw milling machine" built by the Robbins & Lawrence Co., at Windsor, Vermont, in 1855, and now (April 3rd, 1924) still on production work at the revolver factory of Smith & Wesson at Springfield, Massachusetts.

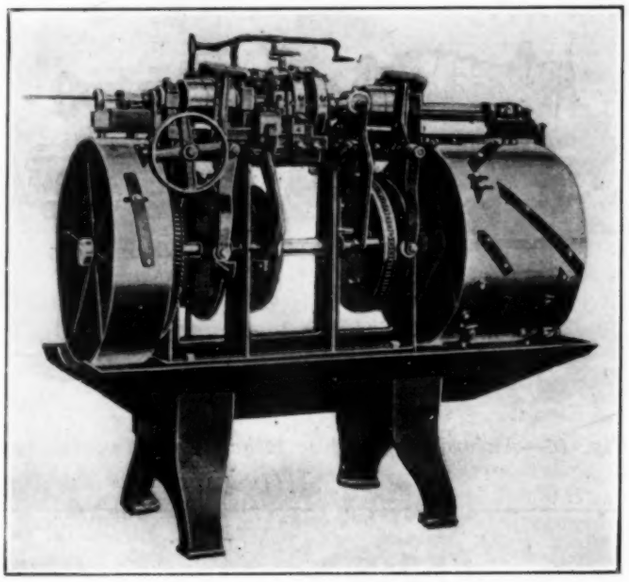


Fig. 22—An old Spencer automatic screw machine which shows the "brain wheel" very clearly

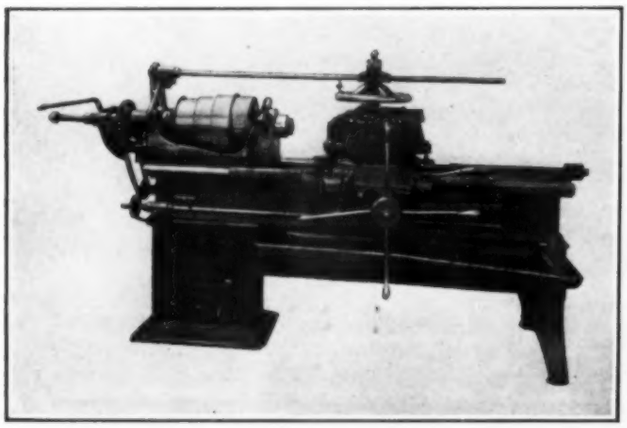


Fig. 21—One of the first Hartness flat turret lathes built by Jones & Lamson. This machine was built in 1896 and is still in use.

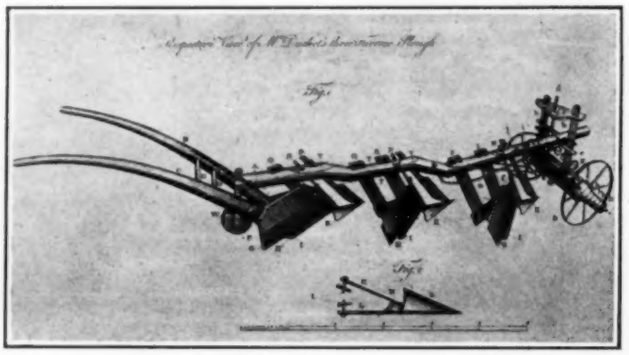


Fig. 25—One of the first attempts to make a semi-automatic plow

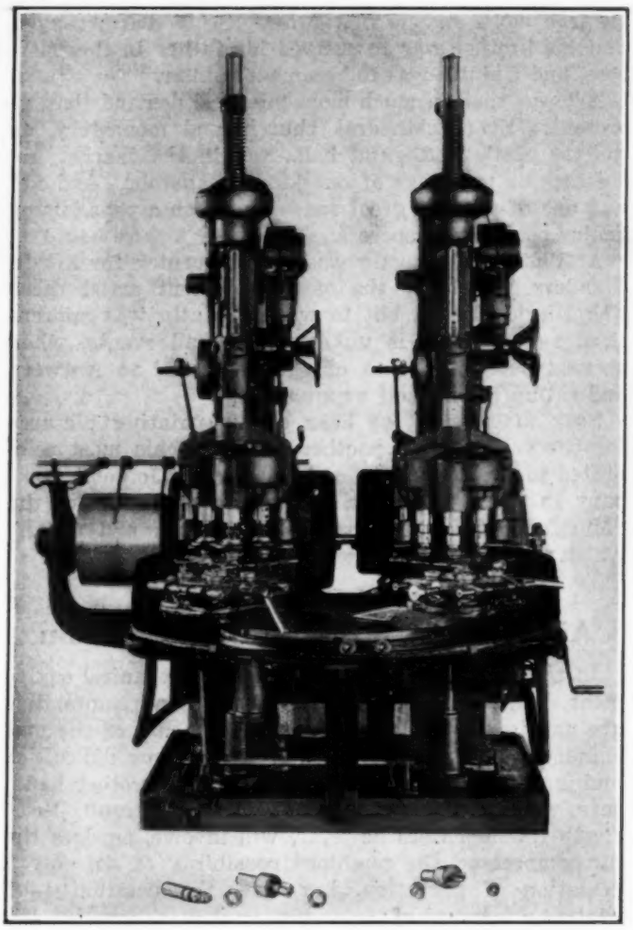


Fig. 24—An automatic drilling and tapping machine of recent design

The application of these fundamental principles to other lines of production is often interesting and instructive. Figs. 25 and 26 show early efforts to make a plow that would regulate the depth of the furrow automatically and plow several furrows at the same time. To us of this day of highly developed tools they are somewhat ludicrous, but it is through such crude attempts that we have developed the automatic plow of Fig. 27 which embodies a transfer of skill equally as great in some respects as do our machine tools. It is interesting to speculate as to how far we shall or can go in making automatic machinery. At first sight there would seem to be no limit except the quantity to be produced. We already have automatic machines *making tools for automatic machines* as in the case of small drills. But again there appear to be some limits to this tendency. In shoemaking we have a most highly developed set of semi-automatic machines that are not likely to be displaced by automatic machines. Perhaps

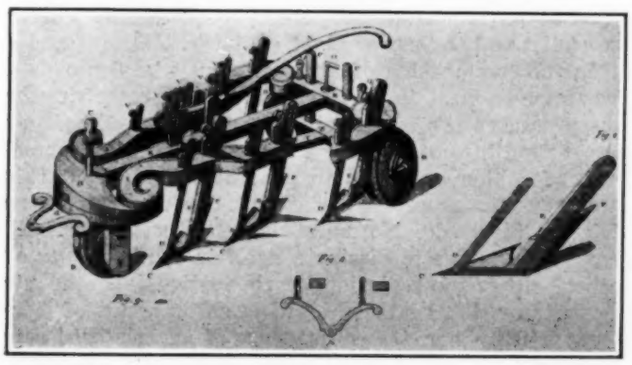


Fig. 26—A semi-automatic plow which was an improvement upon that shown in Fig. 25

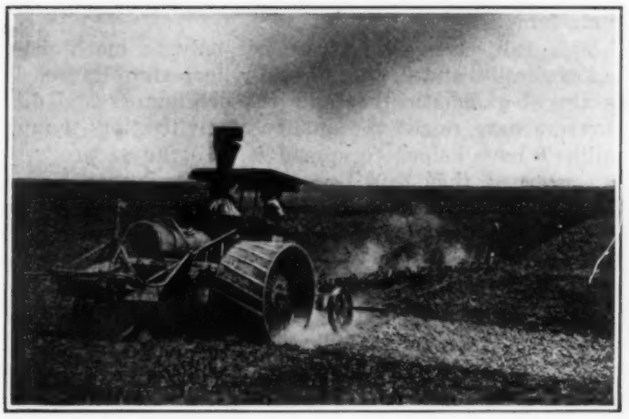


Fig. 27—A modern gang plow which is automatic so far as the operation of plowing alone is concerned

it is possible to build a machine that would manufacture complete shoes automatically, but in all probability it could not compete economically with the machines in use at present and similar conditions can be found in other industries. But the limit of the applications of transfer of skill and thought are still far away in most industries, and the future may see machines embodying these principles that will make modern machines appear as primitive to those then existing as the Hargreaves machine does to this generation of mechanics and designers.

Axioms for Close Limits Manufacture

BY B. H. BLOOD

In order to manufacture to close limits, it must be possible to measure to still closer limits.

The measuring means should be as direct as possible.

Even where direct and accurate means of measurement are available, close work is expensive and should be called for only where the expense is justified.

Tolerances should be set only after a careful study of their necessity and their cost. If right, they should be adhered to. If not, they should be changed.

Cumulative tolerances should be avoided. In placing a tolerance figure on a drawing, the draftsman should consider how it can be checked, the observational error of the measuring instrument, and the influences of tolerances on other related dimensions. Dimensions should read from fixed and accessible points.

Greater clearances usually permit greater tolerances. If both can be increased with safety, economy is bound to result, and in many cases the product may be actually improved thereby.

Coming as the author does from a shop whose business and reputation have been built on precision manufacturing, this doctrine may sound strange. Dirt has been defined as any matter out of place. How shall we describe precision out of place?

An excerpt from a paper presented at a joint meeting of the Engineers' Club of Philadelphia, Philadelphia Local Section and the Machine Shop Division of the A.S.M.E. at Philadelphia, Pa., on March 25, 1924.

Famous Machinists of History

By H. H. Manchester

Rather careful research which the writer has been able to make recently in the lives of men of genius has disclosed a number of machinists who became famous.

This subject is of interest not only to machinists, but generally, and in fact of really deep significance. It is almost axiomatic that only the originators and discoverers have raised the quality of civilization, though millions have helped to spread it. So far as progress is concerned, they have been the only producers. Hence men of correct and beneficial originality have been the world's most precious product, and deserve study and cultivation, just as the one most profitable product on a farm reecives the attention of the scientific farmer.

A scientific investigation of such men would discover what they started from, what aid was given them, and how they came to develop. It would then take the results and see whether it is possible to select the potential producers of the present without their having to fight their way to the top, with an unknown loss to civilization through waste of time and the destruction of many possible originators in the process.

All of this would carry us much further than is possible in these sketches, but is mentioned to indicate the importance of the subject.

Quintin Matsys (1466-1530)

Quintin Matsys was born in Louvain in 1466. His father was a smith, and held the offices of clock-maker and builder to the city. Quintin at first, along with his elder brother, followed the business of his father.

Quintin Matsys

At that date the guilds were rather minutely subdivided. There were armor smiths, chain smiths, iron smiths, nail smiths, gun smiths, sword smiths, lockmiths, and spurriers, all working in iron, to say nothing of copper smiths and tin smiths. The horseshoer was likewise entirely distinguished, and was designated then as a farrier.

Matsys seems to have been an ironsmith capable of doing delicate work in ornamental iron, or in the bronze which was used in machinery for clocks. Whether he ever used a lathe is uncertain, though foot lathes for iron working were known. There were also drills for iron work which were driven by means of a bow.

But something happened which kept Matsys from continuing as an iron worker. He fell in love with the daughter of an artist, and she persuaded him to drop his iron work and go in for art. So it was arranged that his brother was to succeed his father in the business, and Quintin was to become a painter.

Art was then in much more practical demand than at present. Every cathedral, church, and monastery, as well as castle and guild hall, was in the market for frescoes or paintings of one kind or another. And art was one of the two great roads by which a poor boy of genius could reach success.

At that time Louvain was a chief center for art in Flanders. Probably the most prominent artist there was Dierick Bouts, but to whom Quintin was apprenticed as a master is unknown. At all events, when about twenty-five years of age he moved to Antwerp and set up for himself as an artist.

Soon afterwards we hear of his painting pictures for one cathedral or another. Perhaps his most celebrated pictures were one painted for the Joiners' Company in the cathedral at Antwerp, and another of the "Mary's of Scripture around the Virgin and Child," which was ordered for the cathedral of Louvain.

Air Compressor Cylinder Lubrication

In the operation of certain types of mechanical equipment, faulty lubrication or the use of lubricants that are unsuited to the operating requirements of the machinery may often lead only to troublesome difficulties and inefficient operation. There are, on the other hand, cases where even expensive shutdowns may result. Relatively few machines however, will involve, as does the air compressor, the combined possibility of not only a cessation of operation, but also, the possibility of explosion in event of:

1. Improper selection of the air cylinder lubricant.
2. Excessive feeding of the lubricant.
3. Oil pockets occurring in the system, due to improper design.
4. The absence of an after cooler (by which oil accumulations and dirt can be removed).
5. Discharge piping being too small or congested to be able to handle the requisite volume of air without the necessity for a decided increase in its velocity, and consequently its temperature.
6. The occurrence of air leaks on account of inefficient delivery valves.
7. The continued compression of air which is not free from dirt. The air intake should therefore, be so located as to secure clean, cold air, or a suitable air filter should be used.

Air compressor lubrication is, consequently, looked upon as an important problem by both the lubricating specialist and the power plant engineer.

In the compression of air, work must be done; as a consequence, heat is developed, temperatures rising as the pressures are increased. The evolution of heat by the expenditure of work is a natural physical phenomenon. Machine operation in general brings about this occurrence to a more or less extent, depending upon the friction involved. Normally, however, such heat will have opportunity to dissipate itself in some manner or other, either by radiation or conduction. In the air compressor, the heat developed is not a result of friction; it is, rather, the consequence of an increased rate of impact between the molecules of air composing the charge which is being compressed in the cylinder.

An excerpt from *Lubrication* published by the Texas Co.

THE flywheel on an automobile motor performs two important functions beside storing energy to carry past dead centers. The starter gear and also one member of the clutch assembly are now carried by the flywheel. For this reason it must run true on the crankshaft and requires great care in machining to insure concentricity and squareness with the crankshaft itself.

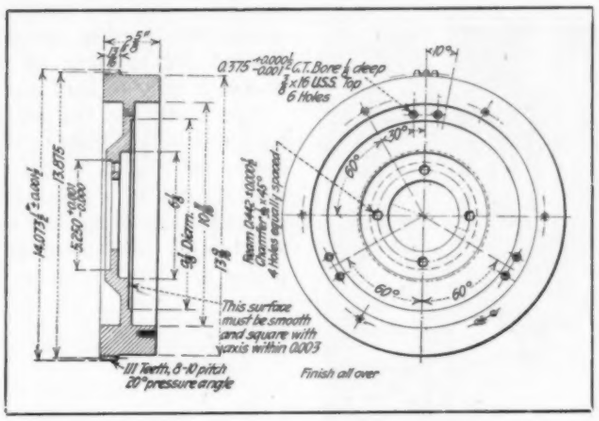


Fig. 1—Details of the flywheel

Maxwell Methods in Flywheel Work

By Fred H. Colvin
Editor, *American Machinist*

Machine equipment, together with some of the tooling fixtures and handling devices — Drilling and tapping in multi-spindle machines — The balancing machine

THE making of the Maxwell flywheel starts with a battery of eight Gisholt Simplimatic lathes, a portion of the line-up being shown in Fig. 2. These lathes machine the castings as they come from the foundry, and are divided into two complete units of four machines each, in which the flywheels are roughed first on one side and then the other, and then finish turned in the same order.

Four men handle the eight machines and turn out 270 flywheels in 9 hr. or 30 per hr., one every two minutes. This department occupies a floor space 18 x 50 ft., or 900 sq.ft., and the output is believed to be unusual for this area. The quality of work is reported as very satisfactory, requiring a minimum of inspection, supervision, and scrap. Fig. 2 shows not only a part of the machines but some of the gages in the lower left hand corner, while stands of a convenient height are shown near each machine.

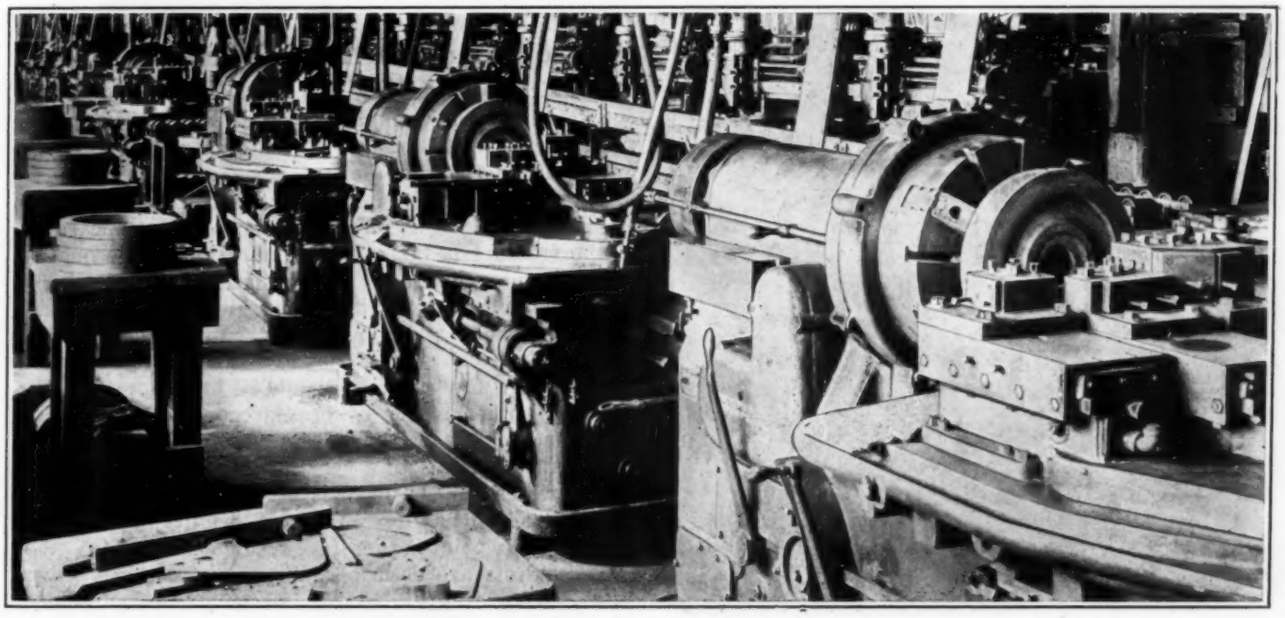


Fig. 2—Part of the battery of Simplimatic lathes

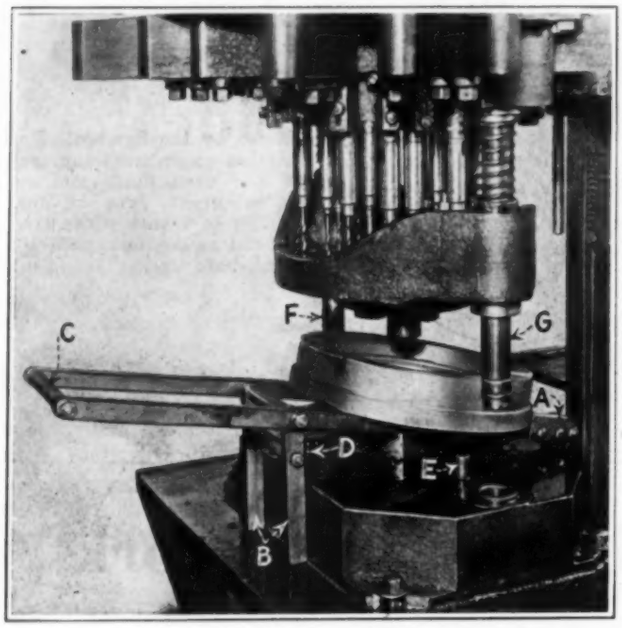


Fig. 3—Drilling all holes in the flywheel

After the turning operations have been completed, the flywheel goes to the Fox multiple-spindle drilling machine, shown in Fig. 3. The flywheel is handled on the frame shown, which is hinged at *A* and supported by the legs *B*. After the wheel has slid down the rails, the handle *C* is raised slightly, the legs swung out and the wheel lowered on to the supports, two of which are shown at *D* and *E*.

The jig plate is carried on the drilling head and moves with the drills. It is located by the pillars or studs *F* and *G*, which enter suitable bushings in the bed plate.

All the holes are tapped at once on the Fox machine, shown in Fig. 4. Flywheels are located on the table by the crankshaft-flange holes. The table is then slid under the tapping spindles and the wheel is properly located for tapping all the holes. The sliding table makes it easy to load and unload the work.

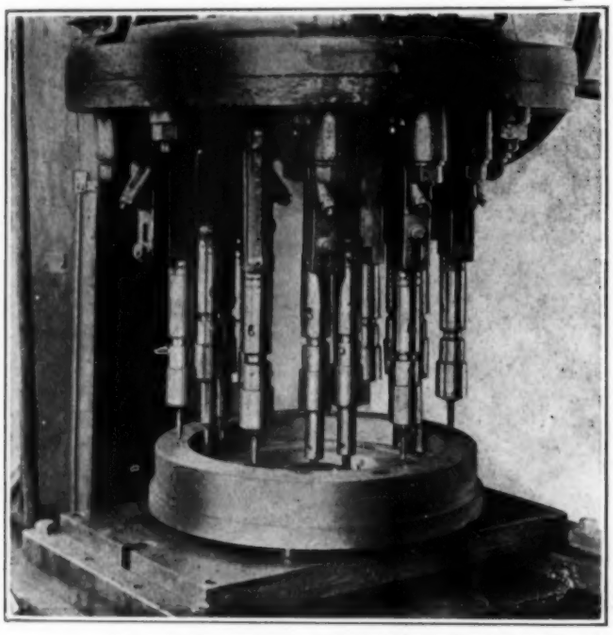


Fig. 4—Tapping the drilled holes

The teeth for the starting gear are next cut, after which the wheel goes to the Crawford balancing machine shown in Fig. 5. This machine is a very convenient combination of a balancing machine, and a drilling machine for removing the superfluous metal from any desired point. Running the wheel indicates, by recording plates and dial indicator, the amount of stock to be removed to give a correctly balanced wheel. The wheel is supported under the drill by the arm *A* so that it can be drilled and retested without removing it from the machine. The work of balancing is done very quickly and with satisfactory accuracy by this method.

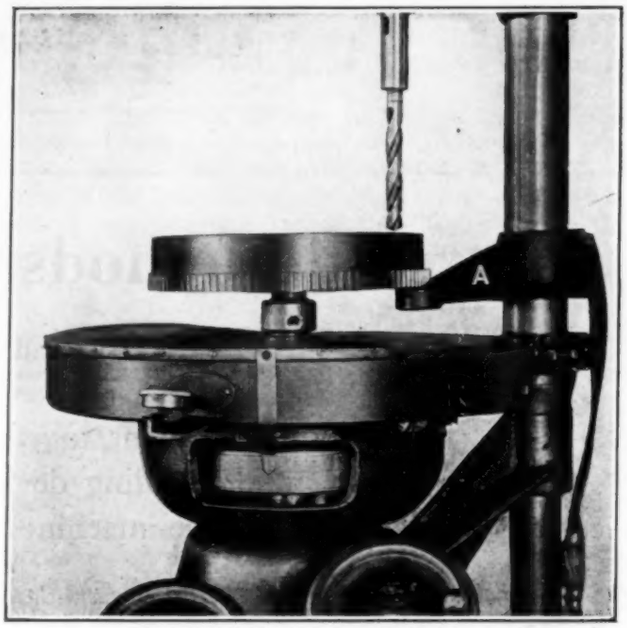


Fig. 5—Combined balancing machine and drill

Improvement Needed in Nick-Bend Test

The nick-bend test as it now stands in most American specifications for wrought iron is nearly meaningless, according to the Bureau of Standards, and should be either eliminated or re-defined.

This test consists in nicking the bar with a chisel and then breaking it off at the nick. The appearance of the fracture is taken as an indication of the quality of the iron, and nearly all specifications for wrought iron include such a test, the "crystallinity" of the fracture being the criterion by which the material is judged.

Most American specifications were found to be rather lax as to how the specimen should be broken, permitting it to be broken either by pressure or by blows. The tests made at the Bureau of Standards showed that the appearance depends to a very large extent on the manner in which the specimen is broken, while the character of the iron has less effect. A definite specification covering this point is therefore recommended.

These tests are described and the conclusions given in Technologic Paper No. 252, which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents.

Repairing Locomotive Main and Side Rods

By Charles F. Henry

Detailed information concerning the methods in use on the Santa Fé System for reclaiming broken and worn connecting rods to fit them for further service

ALTHOUGH broken locomotive rods are not a common occurrence, they do break often enough to make a real problem in repair work. The repair of locomotive rods has been given much study by the mechanical executives of the Santa Fé and it has developed a standard practice to be followed in all such cases.

In order to insure that adequate facilities are provided, rods can be welded only at five shops of the line, Topeka, Newton, Albuquerque, San Bernardino and Cleburne, and in each case the welding must be done under the direct supervision of the general foreman blacksmith. All welded rods are stamped with the initials of the shop doing the work and the date of the weld, ¼-in. letters being used. The superintendent of the shop

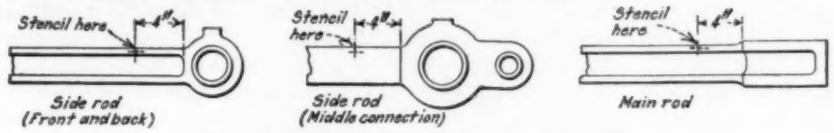


Fig. 1—Where the rods are stamped

or the master mechanic must keep a record of each weld, giving the number of the locomotive from which the rod was removed, the locomotive to which it was applied and the name of the blacksmith doing the work. In Fig. 1, the standard location of the stamping is shown.

The first operation on a plain rod is to upset the broken ends and scarf them in the form shown in Fig. 2 to prevent slipping when being welded. Two pieces or slabs made from Tennessee iron or from staybolt croppings, are shaped as shown and put in place, care being taken to see that the grain of the iron in both slabs runs in the same direction.

The center of the weld should be made under the steam hammer at the first heat, leaving the working of the edges to a second heat. The second heat should close the edges and the weld should be finished by the third and final heat.

Two methods of welding rods having an I-beam section are shown in Figs. 3, 4 and 5. The method shown in Figs. 3 and 4 is preferred for rods having a shallow flute and a deep flange. The broken ends are upset for about 4 in. The flanges are spread slightly and slabs of Tennessee iron or staybolt croppings are fitted and welded in as shown, to make a rectangular section. The rods are then scarfed, and the ends lipped over to prevent slipping, as in Fig. 4. The slabs of iron already welded in place make it unnecessary to put iron slabs between the scarfed ends. After welding, the rod is forged down to the proper size and the channels or flutes milled or planed.

Another method, preferably for rods having a deep flute and thin flanges, is shown in Fig. 5. The flanges are hammered together, making an enlarged end for about 4 in. Then blocks of refined iron are welded on top of the flanges as shown at *A*. The ends are then

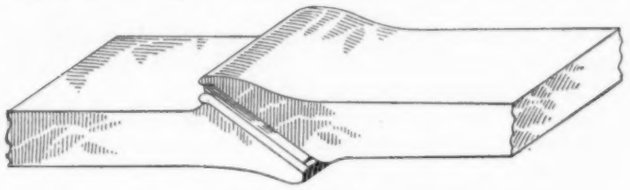


Fig. 2—Welding slab section rods

scarfed, as in Fig. 4 and the rods welded, forged to shape and the channels milled or planed.

While all rod straps are scrapped after the bolt holes reach a diameter of ⅛ in. larger than the original size, the holes in the rods are plugged and then redrilled to standard size. Old rod bolts are used for plugging the holes, after heating them the whole length to insure completely filling the holes. The plugs are welded, one end at a time. The rod is upset as at *G*, Fig. 6, and afterward forged down as at *B*, Fig. 7. An iron slab of the shape shown is welded on each

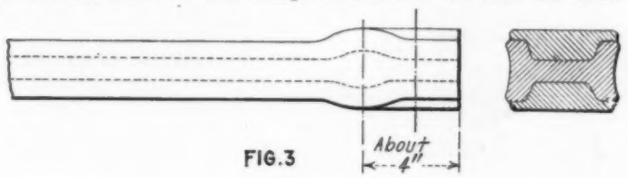


FIG. 3

FIG. 4

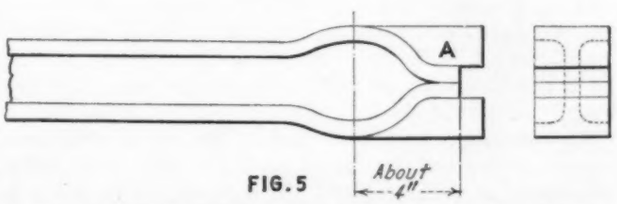


FIG. 5

Fig. 3—Handling I-section rod. Fig. 4—Making the weld. Fig. 5—Another method for I-beam rods

side, using two heats. The end is then forged to size, allowing for the proper finish.

On some rods a little different method is used. The rod is upset at *G*, Fig. 8, the edges are hammered to spread, and the keyway is closed and welded, leaving a depression at *H*, Fig. 10, which is filled by welding

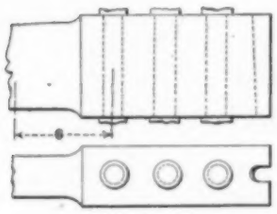


FIG. 6

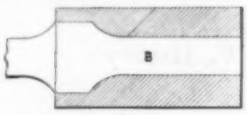


FIG. 7

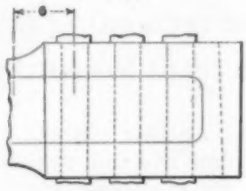


FIG. 8

Fig. 6—Bolt holes plugged. Fig. 7—Side plates welded on. Fig. 8—End of fluted rod

in the piece shown. Then an iron slab is welded on each side as in Fig. 9, after which the rod end is forged to proper dimensions for finishing.

During the forging the flute *C*, Fig. 9, will close to some extent. It is not machined but allowed to remain as forged.

There are a few variations for special rods but the general practice is given here. When a new strap is applied on account of worn holes, the holes in the rod are always plugged, even though they have not worn to the $\frac{3}{4}$ in. limit.

Rod straps are carefully tested whenever they are taken down. After being thoroughly cleaned they

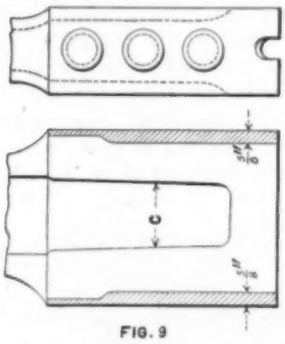


FIG. 9

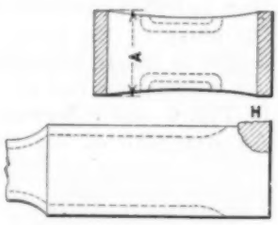


FIG. 10

Fig. 9—Another way of welding. Fig. 10—Filling in keyway

are given a coat of whitewash. When it dries they are hammer tested and inspected for cracks. The smooth, flat end of a machinist's hammer is used and care is taken to prevent bruising or battering the strap in any way.

The Santa Fé makes it a rule to anneal main and side rods every four years, and straps every three years. New rods and straps are annealed after forging and before machining. No straps are to be welded. Before annealing, all rods and straps are carefully tested for defects.

In annealing, both rods and straps are heated to a bright cherry red, visible in daylight, care being taken to secure a uniform heat throughout. The work is supported to prevent sagging and to avoid contact with the bottom of the furnace. After heating, the work is removed from the furnace and allowed to cool slowly.

After annealing, all rods and straps are again inspected for defects that might be revealed by the annealing process. Each rod and strap is then stamped with the date and place of annealing, all previous dates being obliterated to avoid confusion. In this way a complete record of the rod can be seen at all times, as the stenciling includes data on welding, annealing and date of application, as well as the shop where the work was done.

An Example of Unilateral Tolerance—Discussion

By James McIntosh

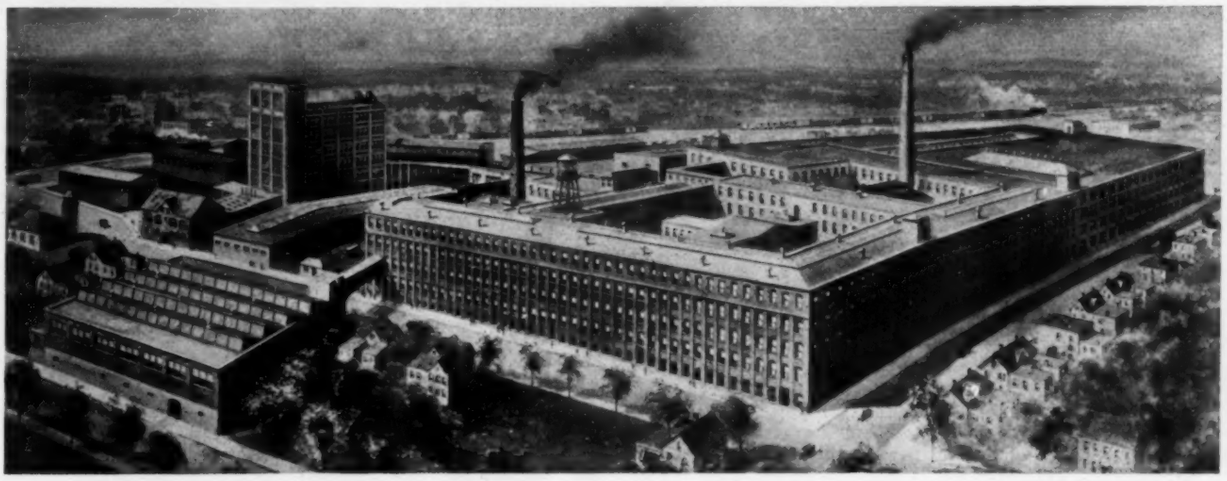
On page 375, Vol. 60, of the *American Machinist*, there appeared an article by Charles F. Henry under the title given above. In the case cited $\frac{1}{2}$ in. $^{-0.001}_{+0.000}$ is easier to state than to accomplish. The same is equally true of the shouldered stud 2.005 in. $^{+0.001}_{-0.000}$ and yet there is a possible difference in lateral tolerance of 0.005 in. Regardless of the tolerance, there seems to be a tendency to get too close to the high or low limit, instead of aiming at the mean dimension. For instance, if a length is 6.000 in. $\pm$0.005, the limit is a concession tolerated to aid production and thus eliminate what would be an absolute size $\pm$0.000 inch.

I can recall an instance where the absence of limits would have tended to lose a war if the silly stand had continued. The trouble was due to failure to recognize the true value of limits as applied to a simple drill jig—a plate with two rows of holes and two dowel pins, the latter to locate a camshaft casing or the top of two cylinder blocks. The studs had a clearance of $\frac{3}{32}$ in. in the cam-casing holes, but regardless of that there was a total absence of limits, with the result that absolute spacing was the only thing. Unilateral tolerance along the lines cited by Mr. Henry would have solved that problem, provided the limits did not total more than $\frac{3}{32}$ in. in the case of some 15 holes in line.

In the case of bilateral tolerances, if the first and second holes indicate a distance + 0.005 in., to locate the third from the second the distance should be — 0.005 in. to be accurate. To correct in this way is usual, but perhaps the safest way is to locate every hole from the starting point, or first hole, using a limit of $\pm$0.010 in. to be safe. To start with such a limit and permit a plus or minus reading to add up, would evidently be fatal with 15 holes and $\frac{3}{32}$ in. clearance.

Zinc Bath vs. Lead Bath

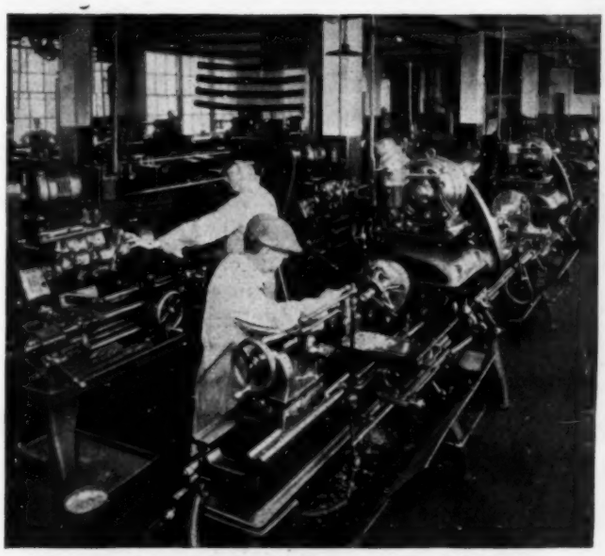
A zinc bath as a substitute for a lead bath would be a very unsatisfactory heating medium for a number of reasons; according to A. N. Armitage, metallurgist, Columbia Steel Corp., Pittsburg, Calif., in answer to a question in the current issue of *Transactions of the American Society for Steel Treating*. The range is short and zinc melts at 787 deg. F. If heated over 900 deg. F. there will be a considerable zinc loss through drossing. Furthermore, the zinc will coat the steel quite considerably. The hot dip process of galvanizing consists of dipping the articles in hydrochloric acid and then immersing them in the molten zinc bath. The zinc will adhere to the steel parts even without the preliminary acid dip.

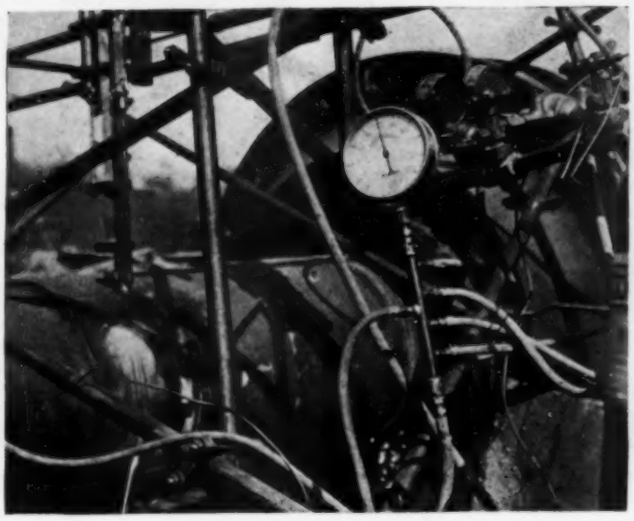


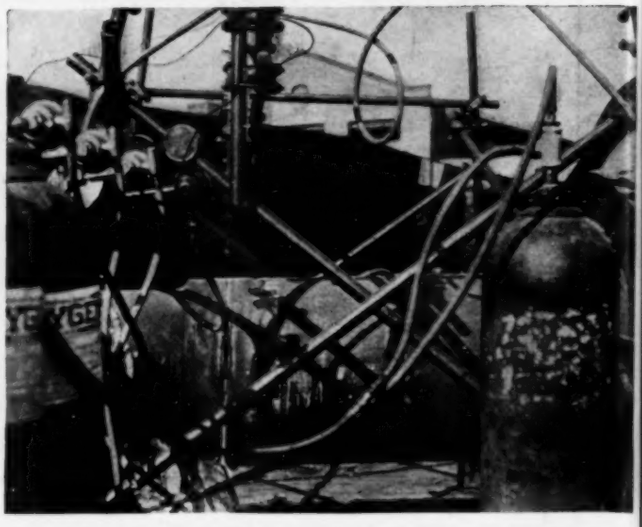
Where Machine Tools Are Made

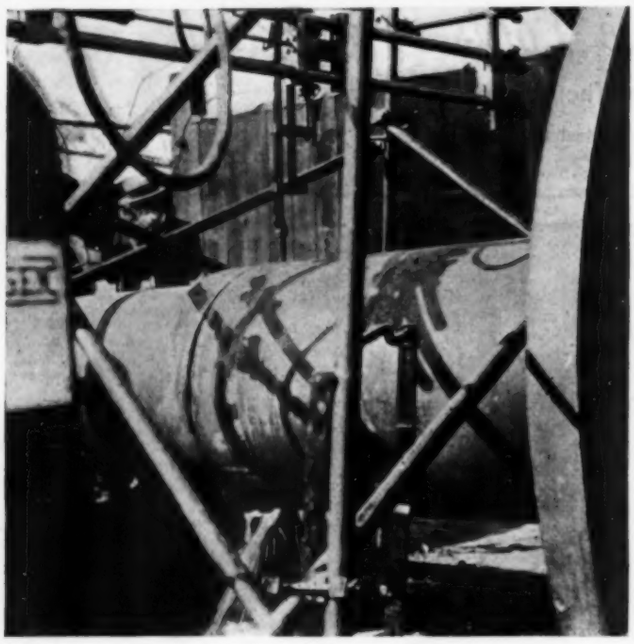
Taft-Peirce Manufacturing Company

Established 1884



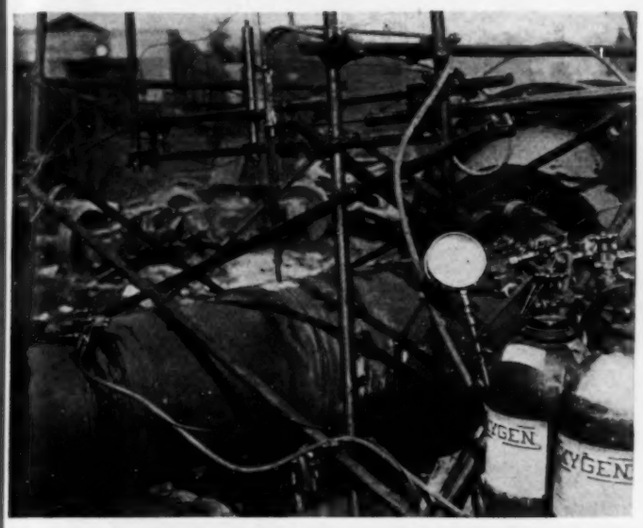


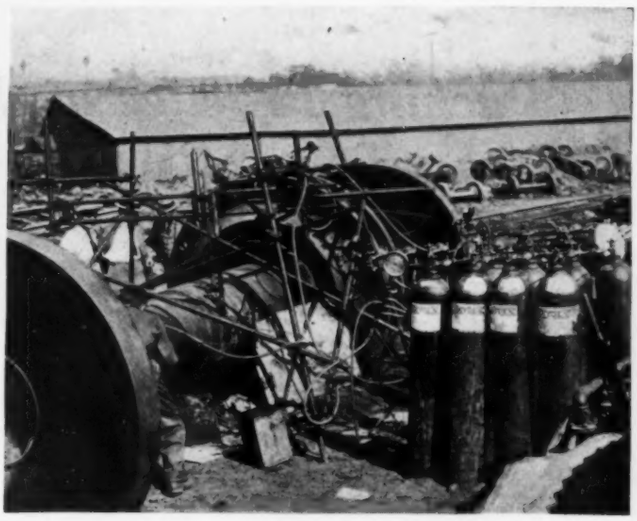




Cutting up Steel

The generator shaft shown in the illustrations was cut up in the Los Angeles yards of the Union Pacific for use in making drop forged axles, frames, etc. The work was done by the Purox Company using hydrogen and oxygen in its style F cutting torch equipped with a straight head and a No. 4 hydrogen tip. Oxygen pressure was 75 lb. and hydrogen presure, 60 lb. Six hundred cu.ft. of hydrogen and 2,000 cu.ft. of oxygen were used per hr. in making the five cuts through the 27-in. steel

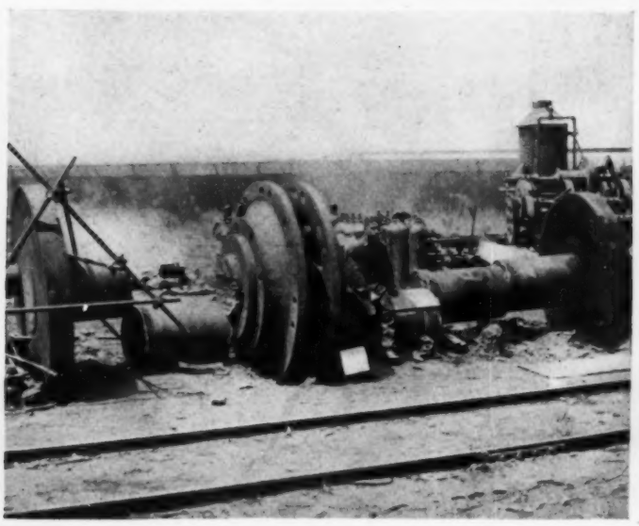




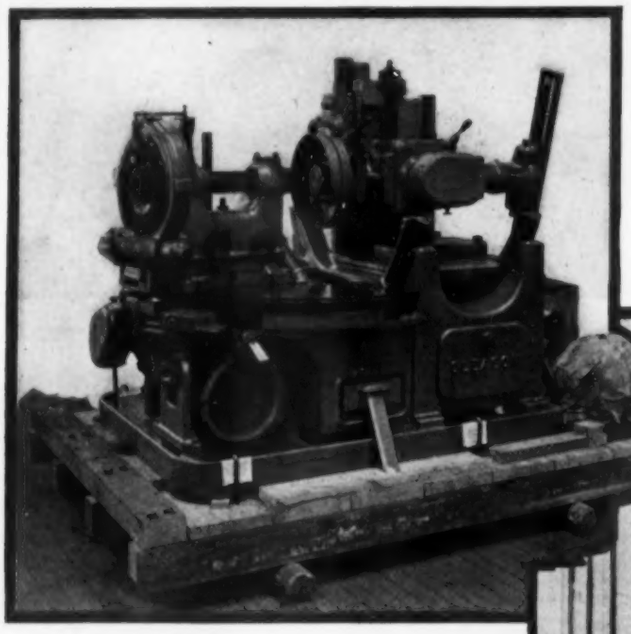
with Oxy-Hydrogen

shaft. It took from ten to seventeen minutes for each cut. The pipe framework shown was rigged up to carry the hydraulically operated carriage on which the cutting torch was mounted. Vertical motion of the torch was accomplished through the use of another water piston attached to the carriage. Control of the two pistons through a remotely situated needle-valve permitted the operators to escape the intense heat generated by the heavy cut. The tip was kept at a constant ½-in. distance from the shaft surface.

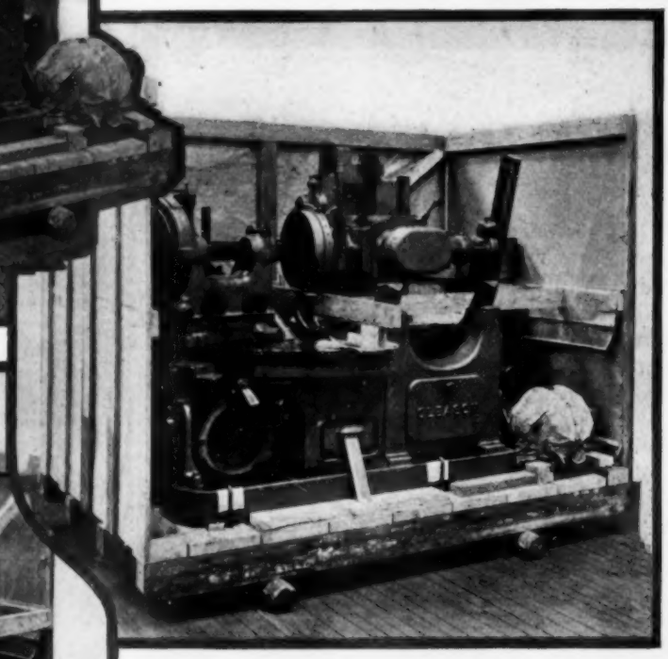
Photographs by courtesy of Compressed Gas Corporation

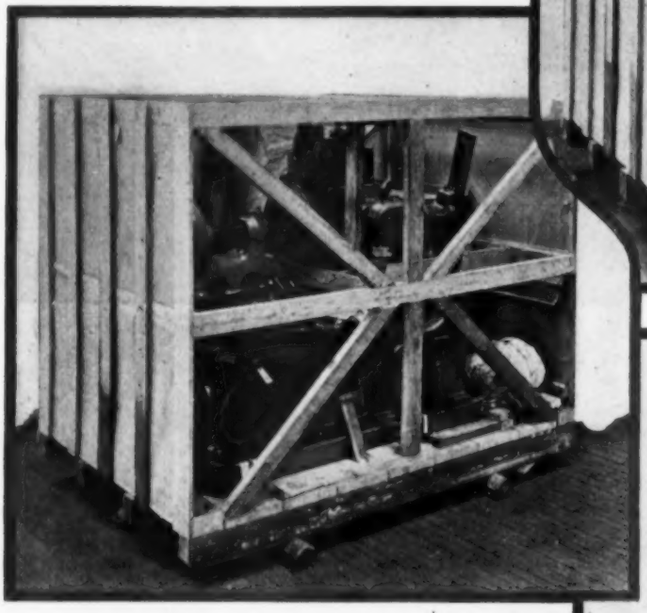


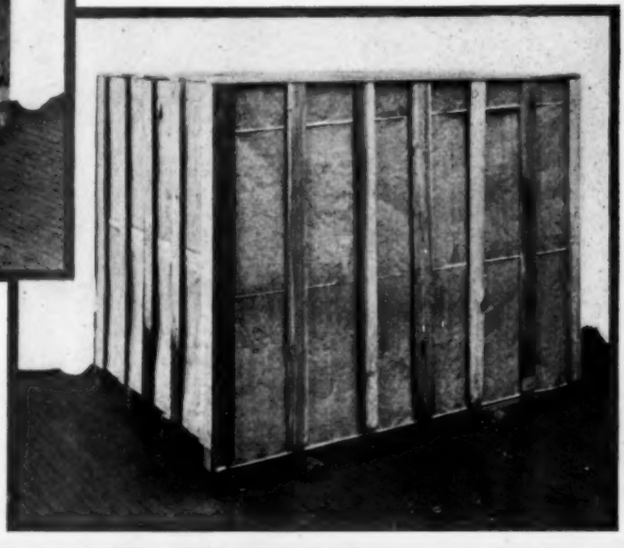
Packing Practice at the Gleason Works



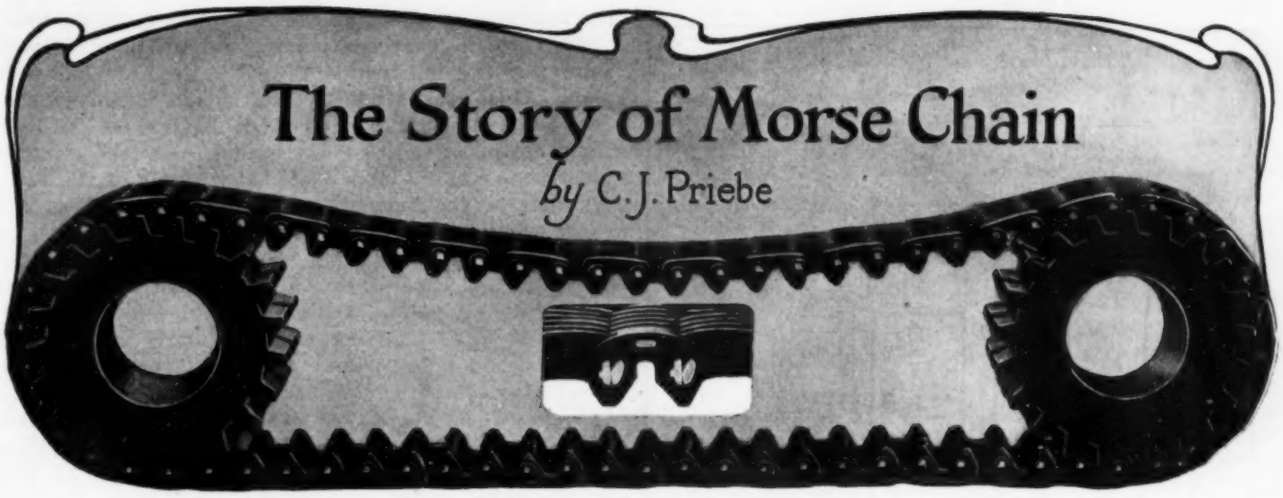
Left—The machine on skids
Below—Sides and back of crate in place







Above—Crate complete except tar paper front
Right—Ready for domestic shipment



First article of the series—The development of the chain and its manufacture—Growth of the company — Layout of the units of the plant

SILENT chain has become an indispensable factor in the transmission of power. Mindful of this it is our intention to review the work of the Morse Chain Co., the largest manufacturer of silent chain in the world. Both the drive itself and the methods employed in manufacture are the results of long experience in the field, since the concern was one of the pioneers in the development of power transmission by means of silent chain.

The company has but one chain-manufacturing plant in the United States, located at Ithaca, N. Y. Here the chains and their sprocket wheels are made, in sizes ranging all the way from drives employed on signalling apparatus to those transmitting thousands of horsepower in rolling mills and similar installations.

The development of the silent chain is due largely to the influence of the bicycle industry. The Morse brothers, E. F. and F. L., had been making buggy springs and roadcarts, but started to make bicycle chain in 1893. It was then that they developed the block chain with the rocker joint, and in 1901 the toothed silent chain. The distinctive feature of Morse chain is this rocker joint at the pins for the reduction of friction, the construction of which joint can be seen in the headpiece. On January 1, 1898, the Morse Chain Co. was incorporated for the manufacture of chain,

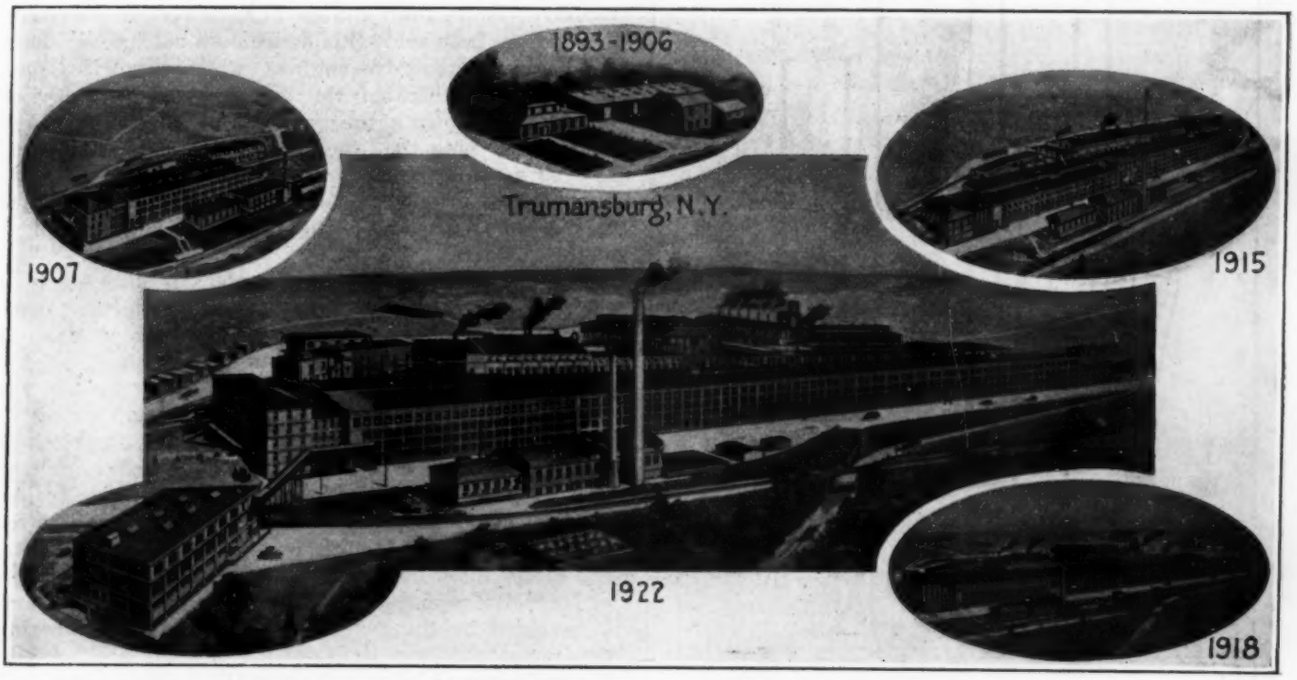


Fig. 1—Plants showing the growth of the Morse Chain Co.

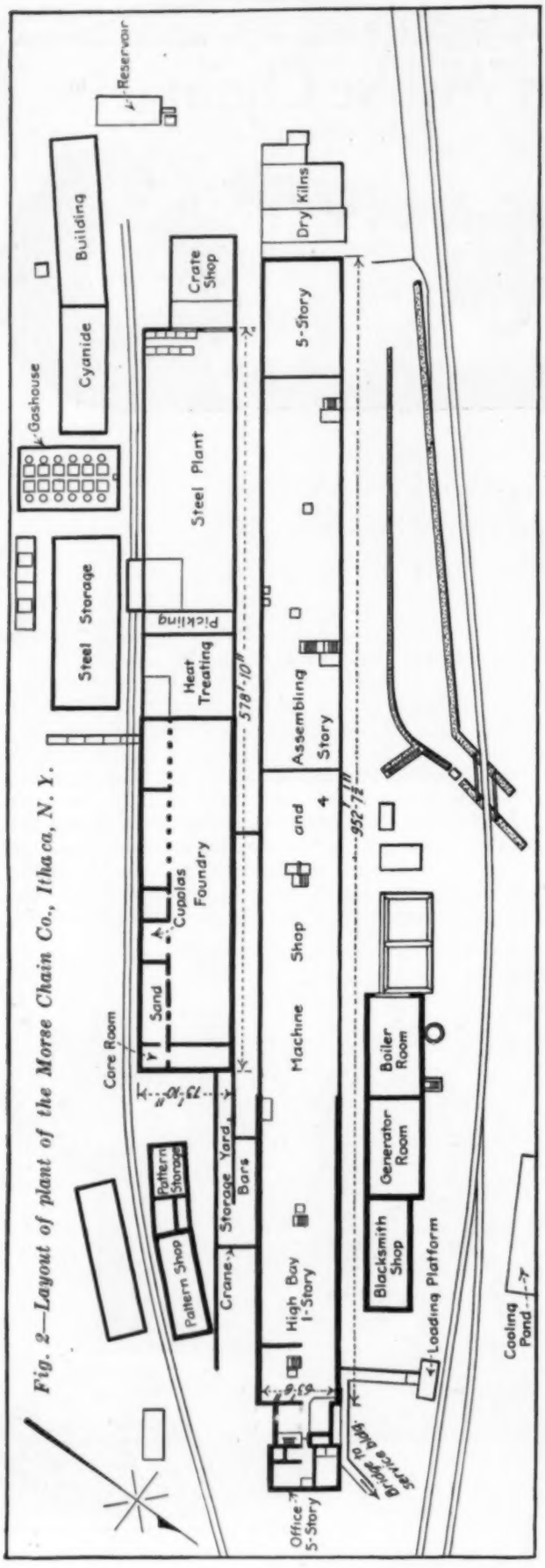


Fig. 2—Layout of plant of the Morse Chain Co., Ithaca, N. Y.

the concern having been a co-partnership up to this time.

The growth of the company and its plant is well shown by the illustration given in Fig. 1. The first plant, which was gradually built up at Trumansburg, N. Y., can be seen at the top of the illustration. In 1906 the company moved to the present site at Ithaca in the plant shown at the upper left-hand corner of the illustration. As the demand for power chain increased, the capacity of the plant was doubled in 1914, and later in 1916. Further additions were made in 1922, so that the plant appeared as shown in the central portion of the illustration. At the present time even more building operations are going on, particularly at the right or south end of the plant. Since 1912, building operations have been practically continuous.

It might be noted that Ithaca is a city with over 17,000 resident population. The plant occupies a splendid situation on South Hill and overlooks both the city of Ithaca and Lake Cayuga. The D. L. & W. Railroad passes in front of the plant and spur tracks are brought between the buildings.

About 1,700 Employees in All Plants

At present the chain company has about 1,400 employees, 300 of whom are women. In addition there are about 100 employees in offices doing sales, engineering and service work, and 200 in the Detroit plant where sprocket wheels are made for use with automobile chain. Although naturally the size of the force has varied with business conditions, a night force has been employed continuously since 1914. This night work is chiefly in the departments where intermittent operation is not desirable, such as the heat-treating rooms and power plant, and also where special equipment must be kept busy in order to make it profitable, as in the press room and steel mill.

The total manufacturing floor space of the plant is 9½ acres, while there are 80 acres of ground. The year's payroll at present is about $1,350,000, and the capitalization $3,000,000. About 2,000 to 2,500 tons of chain are shipped each year and the amount is growing rapidly. Some four million horsepower in industrial drives have been sold; this figure does not include chain for use on automotive engines, which comprises one-fourth to one-third of the business. It is really of interest as showing the romance of engineering and business to note that the whole silent-chain industry, as well as this particular business, has been built up during the lifetime of one man, F. L. Morse, who has been general manager since 1902, and later president of the company.

Because of the fact that the plant is situated in a comparatively small community, it has to be a bit more independent and self-sufficient than a plant located in a large city. The general layout and grouping of the different units can be observed in the large view of the plant in Fig. 1, as well as in the floor plan shown in Fig. 2. The main building at the front of the plant is four stories high, with five stories at the office and the new addition, over 950 ft. long and 62 ft. wide inside. It faces the northwest and has an unobstructed view over the city, so that an abundance of light is assured. The end of the main building at the left of the illustrations and usually referred to as the north end of the plant, is occupied by the general offices and the engineering department; the remainder of the building is filled with the various machining and assembling departments.

At the left of the illustrations and back of the main

building can be seen the pattern shop and pattern storage building. Moving toward the right, the foundry is housed in the next building. Continuing further toward the right, or south, we come to the heat-treating department and then to the steel mill.

Back of the steel plant, where the row of small stacks

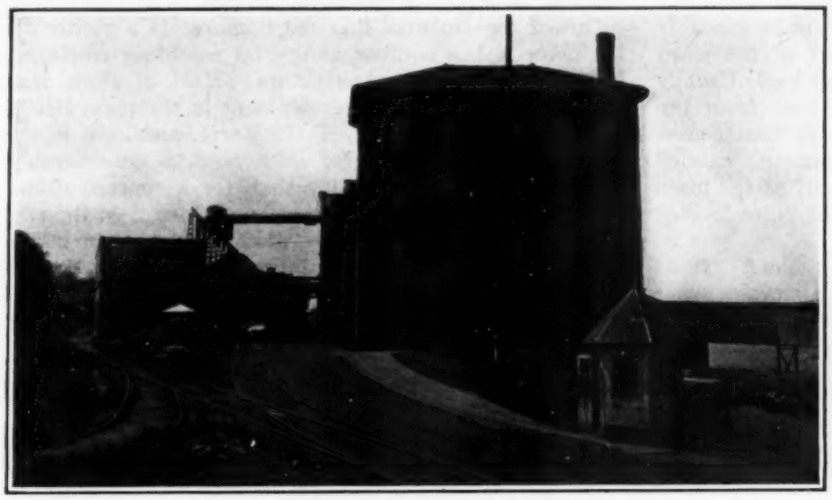


Fig. 3—North end of Morse plant, showing three levels

can be observed, is the gas producer house, where all the gas necessary for heat-treating operations is generated. The last building at the right is the cyanide room where the hardening is done. Since the company supplies its own electric power for use throughout the factory, a power plant, located conspicuously in front of the main building, is included in the installation. All of the buildings are of modern reinforced concrete-and-steel construction; and with the exception of a small portion of the plant where steel trusses are employed, the roofs are of concrete.

The first thing that attracts attention in the general layout is the use made of the slope of the ground on which the plant is built. The arrangement, which gives three levels of approach to the different buildings, shows up very well upon viewing the plant from the north end, as is done in Fig. 3.

Down at the right in the illustration is the lowest level, at which there is a roadway for vehicular traffic. Back of the main building the main railroad siding can be seen, going between this building and the foundry and steel plant. Another siding goes to an elevation considerably higher in the rear of these buildings and between them and the gas house and cyanide building. The use made of these different levels will be noted later. Before passing on to other views, some mention should be made of the modern crane equipment that shows here. The larger crane has 3-ton capacity, and covers the bar steel storage yard.

The upper track serves as the main receiving track for the materials that enter into the product itself, and the lower as the main shipping track. Coal for the gas producers, supplies for the foundry, and steel for the steel mill are brought in on the upper track. This track, which is shown in Fig. 4, is on the level of the charging floor, so that the raw materials are carried to the height required without the need of any auxiliary elevators. Some pig iron and scrap can be noted stored in the yard. Molding sand is put through the chutes at *A* into storage spaces below the level of the track, and the core sand at *B*. Coke is put in the doors *C* so as to be at the charging level. The tops of the two cupolas can be seen in the center of the picture.

The gas producer plant is thoroughly modern and quite new. There are at present eight Westinghouse suction producer units in the plant, and more are being installed. The gas is sent directly to the steel mill and annealing and cyanide rooms, which adjoin the gas house, and no tanks or receivers are required. The absence of receivers, of course, necessitates the use of automatic apparatus for pressure control.

Anthracite coal is burned in the producers. It is brought in front of the gas house in railroad cars, and dumped into a large hopper under the tracks. It then is carried by an elevator to an overhead hopper having a capacity of 100 tons, and is fed to the producers by gravity when charging them. But little labor is re-

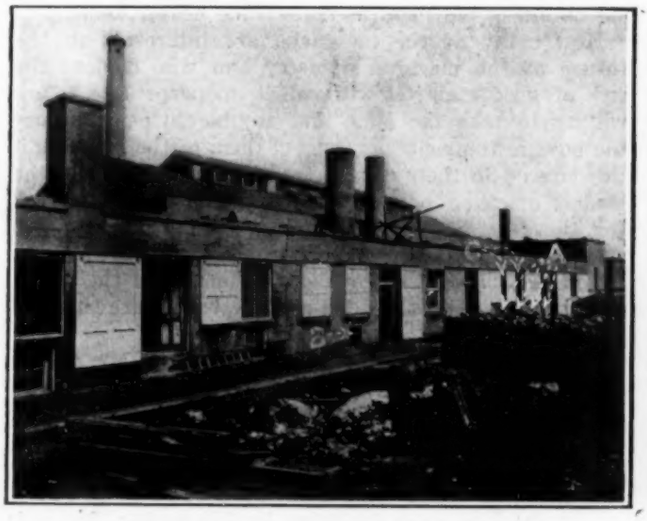


Fig. 4—Receiving track back of foundry. Fig. 5—Restaurant in employees' service building

quired, as three men handle the work. Each producer consumes about 350 lb. of coal per hour, and the total consumption needed to supply the fuel for the furnaces is about 150 tons for a six-day week. The efficiency of the whole process is quite high.

As for the power plant, there are five Babcock & Wilcox boilers having a total rating of about 3,000 hp.; the steam pressure is 175 lb.; and the main stack is 181 ft. high. The heating load for part of the plant is carried by the same boilers as the power load. Usually the exhaust steam for this purpose is bled from the second stage of a three-stage turbine. It then passes through coils past which the air is blown and carried to different parts of the plant. About half of the main building is heated by a separate gas-fired plant located in the sub-basement.

Bituminous coal is burned in the boilers. It is dumped on the main track and drops to a storage space on the lower floor of the main building, where ten 50-ton cars can be dumped. A belt conveyor brings the coal to the crusher, and an elevator then raises it to an overhead hopper holding two carloads. It feeds by gravity to the boiler room, where inclined and moveable elevators are used to put it in the hoppers of the Westinghouse stokers. From 150 to 200 tons are burned per week. Ash is well handled. It drops into hoppers below the grates and is collected in a small car and run to the elevator, which carries it to the overhead hopper placed conveniently outside the plant for loading wagons.

The generating room is fitted with the most modern equipment. The load comes mainly from the large number of motors for both individual and group drive used throughout the plant. Also, there is the lighting load to consider. The usual load on the line varies from 800 to 1,300 kw. Some of the operations drawing the most power are so timed as to distribute the load rather uniformly throughout the day and night.

Most of the load is borne by a 2,500-kva. Westinghouse a.c. generator run day and night by a three-stage turbine, the voltage being 2,200; a duplicate unit of the same capacity is now being installed. There is a 500-kva. machine generating at the same voltage, and 80- and 300-kw. d.c. machines generating at 115 and 230 volts. By means of a motor-generator set the current can be converted to either d.c. or a.c. as required for the load. Transformers for reducing the voltage of the a.c. to suit the motors are located in the various departments.

Employees' Service Building

The building that was shown at the left in Fig. 1 and lower down on the hill than the main plant, is an employees' service building that has been erected rather recently. A glance at the appointments of this installation will give some idea of the thought that has been expended upon the comfort and welfare of the employees. The building is of modern concrete construction, four stories in height and 80x160 ft. in size. On the top floor is an auditorium and on the third a large cafeteria restaurant, a general view of which can be seen in Fig. 5. A covered runway connected with the main plant enables the employees to come to the restaurant without going out-of-doors. On the second floor is a service store where all sorts of supplies, ranging from groceries to drygoods, are sold to the employees at cost. The bottom floor is used for recreational purposes such as bowling and basketball.

The spirit of the employees is shown by the activity of the Morse Industries Association, to which practically every one of them belongs. The purpose of the association is for the proper organization, support and regulation of all employee activities. Serious matters such as insurance are cared for, as well as lighter ones relating to athletics and social affairs.

One of the features that most impresses a visitor to the plant is the number of special machines employed in the processes of manufacture. Most of these machines are the result of development in the plant itself, being designed largely by F. L. Morse, and built in its own shops. Naturally for such work a considerably larger toolroom is necessary than for a concern doing only maintenance work on its machines. Ordinarily about 30 men are kept busy in the toolroom in building new machines and in maintaining the old ones. The number of chain drives in operation in the plant also impresses the visitor, as they are used very largely for both group and individual motor drives.

Filling the Ranks of Machinists—Discussion

By Charles E. Dawson
Vocational School, Holyoke, Mass.

In his address before the National Machine Tool Builders Association upon the above subject, published on page 473 of the *American Machinist*, John C. Spence touched the heart of the matter when he referred to the comparatively low rate of wages now prevailing in the machine trade. This condition and the apparent indifference displayed by employees toward vocational training are, in my estimation, the chief reasons why boys of the desirable class are no longer attracted.

In connection with my school work I find that employers in other lines of industry are eager to get boys from the schools and are even willing to take them before they have finished their courses, whereas the graduates of the machine department are forced to go begging for jobs while the owners and managers of machine shops pick up any Tom, Dick or Harry that comes along. Many of our boys who would much rather have stayed in their home state of Massachusetts are right now working in Detroit and other machinery centers of the Middle West because they could not obtain employment at their trade nearer home.

How many of the men who are interested in the future of the machine industry and who deplore the lack of good material with which to perpetuate it are willing to take the time and trouble to come before the boys in their classes and tell them of the opportunities offered in their chosen trade? In this respect the leaders of other industries are "putting it all over us," for they *do* so devote a portion of their time, with the result that the interest of the boys is fostered, an incentive is provided for them to put forth their best efforts, the classes are filled and the trades are supplied with a desirable class of workers.

The remedy for the condition discussed by Mr. Spence is largely up to the employers themselves. Let them investigate the possibilities of the vocational schools, devote a small part of their attention to the encouragement of the boys already in the schools and directing the attention of the boys who ought to be there to the possibilities in store for them in this trade. There is a wealth of good material in these schools.

Some Phases of "Government in Business"

By Herbert Hoover
Secretary of Commerce

The vast difference between trusts and trade associations—How the Government is aided by associational activities—Producer, distributor and user all benefit by organization

THE advancement of science and our increasing population require constantly new standards of conduct and breed an increasing multitude of new rules and regulations. The basic principles laid down in the Ten Commandments and the Sermon on the Mount are as applicable today as when they were declared, but they require a host of subsidiary clauses. The ten ways to evil in the time of Moses have increased to ten thousand now.

A whole host of rules and regulations are necessary to maintain human rights with this amazing transformation into an industrial era. Ten people in a whole county, with a plow apiece, did not elbow each other very much. But when we put seven million people in a county with the tools of electricity, steam, 30-floor buildings, telephones, miscellaneous noises, street cars, railways, motors, stock exchanges, and what not, then we do jostle each other in a multitude of directions. Thereupon our law makers supply the demand by the ceaseless piling up of statutes in attempts to keep the traffic open; to assure fair dealing in the economic world; to eliminate its wastes; to prevent some kind of abuse or some kind of domination. Moreover, with increasing education our senses become more offended and our moral discrimination increases.

The question we need to consider is whether these rules and regulations are to be developed solely by Government or whether they can not be in some large part developed out of voluntary forces in the nation. In other words, can the abuses which give rise to Government in business be eliminated by the systematic and voluntary action of commerce and industry itself? This is indeed the thought behind the whole gamut of recent slogans: "Less Government in Business," "Less Government Regulation," "A Square Deal," "The Elimination of Waste," "Better Business Ethics," and a dozen others.

The vast tide of regulations that is sweeping onward can be stopped if it is possible to devise, out of the conscience and organization of business itself, those restraints which will cure abuse; that will eliminate waste; that will prevent unnecessary hardship in the working of our economic system; that will march without larger social understanding. Indeed, it is vitally necessary that we stem this tide if we would preserve that initiative in men which builds up the character, intelligence, and progress in our people.

> The test of our whole economic and social system is its capacity to cure its own abuses. New abuses and new relationships to the public interest will occur as long as we continue to progress. If we are to be wholly dependent upon government to cure these abuses we shall by this very method have created an enlarged and deadening abuse through the extension of bureaucracy and the clumsy and incapable handling of delicate economic forces. The old law merchant is the basis of much of our common law. A renaissance of the new law merchant could so advance our standards as to solve much of the problem of Government in business.
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> American business needs a lifting purpose greater than the struggle of materialism. It lies in the higher pitch of economic life, in a finer regard for the rights of others, a stronger devotion to obligations of citizenship that will assure an improved leadership in every community and the nation.

The field that I am primarily discussing is the great area of indirect economic wrong and unethical practices that spring up under the pressures of competition and habit. There is also the great field of economic waste through destructive competition through strikes, booms and slumps, unemployment, through failure of our different industries to synchronize and a hundred other causes which directly lower our productivity and employment.

If we are to find solution to these collective issues outside of Government regulation we must meet two practical problems:

First, there must be organization in such form as can establish the standards of conduct in this vast complex of shifting invention, production, and use. There is no existing basis to check the failure of service or the sacrifice of public interest. Someone must determine such standards. They must be determined and held flexibly in tune with the intense technology of trade.

Second, there must be some sort of enforcement. There is the perpetual difficulty of a small minority who will not play the game. They often bring disrepute upon the vast majority; they drive many others to

Excerpts from a speech delivered before the annual meeting of the United States Chamber of Commerce, Cleveland, Ohio, May 7, 1924.

adopt unfair competitive methods which all deplore; their abuses give rise to public indignation and clamor which breed legislative action.

I believe now for the first time we have the method at hand for voluntarily organized determination of standards and their adoption. I would go further; I believe we are in the presence of a new era in the organization of industry and commerce in which, if properly directed, lie forces pregnant with infinite possibilities of moral progress. I believe that we are in the midst of a great revolution—or perhaps a better word—a transformation in the whole super-organization of our economic life. We are passing from a period of extremely individualistic action into a period of associational activities.

Practically our entire American working world is now organized into some form of economic association. We have trade associations and trade institutes embracing particular industries and occupations. We have Chambers of Commerce embracing representatives of different industries and commerce. We have the labor unions representing the different crafts. We have associations embracing all the different professions. Of indirect kin to this is the great increase in ownership of industries by their employees and customers, and again we have a tremendous expansion of mutualized insurance and banking.

Although such associational organizations can trace parentage to the middle ages, yet in their present implication they are the birth of the last 50 years, and in fact their growth to enveloping numbers is of the last 25 years. We have, perhaps, 25,000 such associational activities in the economic field.

Ever since the factory system was born there has been within it a struggle to attain more stability through collective action. This effort has sought to secure more regular production, more regular employment, better wages, the elimination of waste, the maintenance of quality or service, decrease in destructive competition and unfair practices, and often to assure prices or profits. The first phase of development on the business side was "pools" in production and distribution. They were infected with imposition upon the public and their competitors. In some part they were struggles to correct abuse and waste. They were followed by an era of capital consolidations with the same objects, but also to create a situation of unbreakable agreements. Both were against public interest and the public intervened through the Sherman Act. Yet underneath all these efforts there was a residuum of objects which were in public interest.

The Value of Trade Associations

Associational activities, I believe, are driving upon a new road where the objectives can be made wholly and vitally of public interest. The legitimate trade associations and Chambers of Commerce with which I am now primarily concerned, possess certain characteristics of social importance and the widest differentiation from pools and trusts. Their membership must be open to all members in the industry or trade, or rival organizations enter the field at once. Therefore, they are not millstones for the grinding of competitors as was the essence of the old trade combinations. Their purpose must be the advancement of the whole industry or trade, or they cannot hold together. The total interdependence of all industries and commerce compels them in the long run to go parallel to the general economic good. Their leaders rise in a real democracy without bosses or political manipulation. Citizens cannot run away from their country if they do not like the political management, but members of voluntary associations can resign and the association dies.

I believe that through these forces we are slowly moving toward some sort of industrial democracy. We are upon its threshold, if these agencies can be directed solely to constructive action in the public interest.

Self-Governing Industry

All this does contain some dangers, but they will come only from low ethical standards. With these agencies used as the machinery for the cultivation and spread of high standards and the elimination of abuses, I am convinced that we shall have entered the great era of self-governing industry and business which has been a dream to many thinkers. A self-governing industry can be made to render needless a vast area of Governmental interference and regulation which has grown up out of righteous complaint against the abuses during the birth pains of an industrial world.

Some people have been alarmed lest this associational movement means the destruction of our competitive system, lest it inevitably destroy the primary individualism which is the impulse of our society. This alarm is groundless. Its rightful activities do not destroy equality of opportunity or initiative. In fact they offer new avenues of opportunity for individuals to make progress toward leadership in the community. Anyone of them will die at once if it does not offer equality of opportunity to its members; or if it restricts its membership, rival associations at once emerge. They are the safeguards of small business and thus prevent the extinction of competition. They are the alternative to capital consolidation. They are not a growth toward socialism—that is Government in all business—they are in fact a growth directly away from such an idea.

Right here for the benefit of the gloomy persons who have a frozen belief that every form of associational activity is a conspiracy to fix prices and to restrain trade, to perpetuate tyranny of employer or employee, we may remember that there are some crooks in every line of endeavor. The underlying purposes of the vast majority and constructive. A minority may be violating the Ten Commandments and need the application of criminal standards.

I am, of course, well aware of the legal difficulties that surround certain types of associational work. I do not believe that the development of standards of conduct or the elimination of abuses in public interest has ever been challenged as a violation of the Sherman Act. Moreover, to establish either a physical or a moral standard directly sharpens competition.

These associational activities are the promising machinery for much of the necessary determination of ethical standards, for the elimination of useless waste and hardship from the burden of our economic engines. Moreover, we have in them not only the agencies by which standards can be set, but by co-operative action among the associations representing the different stages of production, distribution and use, we can secure a degree of enforcement far wider than mere public opinion in a single trade.

When standards are agreed upon by the associations representing the manufacturer and distributor and by those representing the user, we have a triple force interacting for their enforcement.

The Gear Manufacturer Needed

By L. G. Hewins
Sales Manager, The Van Dorn & Dutton Co.

The three classes of gear users and their needs—Gear manufacturers in four classes — Need of analysis of customers' requirements and for planning production

A FEW weeks ago we received in the same mail two letters from machinery manufacturers that struck me as quite significant from our viewpoint as gear manufacturers. One of these letters came from a firm we shall call The Big Dividend Corporation, rated a million, first grade credit. It uses a lot of gears and is a very desirable customer. The letter stated that they had been making their own gears, but had about decided that it would be better to buy them.

The other letter was from a firm we shall refer to as The Wellmeaning Co., whose rating was $50,000 to $75,000, second grade credit—indicating that they were not properly financed. In spite of this, they informed us that they had been buying their gears, but had about decided to install equipment and make their own. Just how they figured they would be ahead of the game by assuming the initial expense ahead of the new equipment, plus the cost of learning to operate it, they did not explain.

These letters suggest certain fundamental questions which confront all gear manufacturers. What position does the gear manufacturer occupy today in the broad field of industry? What great manufacturing service is he rendering that warrants a continuance of his business?

The correct answers to these questions are vital to the success of our industry and valuable to those we serve. We should consider the economic need for the gear manufacturer, and his possibilities for rendering a still greater industrial service. Our market can be properly divided into three classes of gear users.

First — The man who requires a few gears occasionally, either for replacement or experimental work.

Second—Those firms using somewhat larger quantities of gears in connection with equipment they produce or operate.

Third — Manufacturers who use large quantities of the same kinds of gears—day in and day out.

In the first class, we have all had experience with the fellow who comes into the office all out of breath, sometimes with a greasy gear in his hand, who wants us to stop everything else to set up machines for a few parts he urgently needs. We often pitch in to help him out. But possibly if we knew, and dared to charge what it actually cost us to put through his order, we would have to take the rest of his machine in part payment.

Our friends, the automobile manufacturers, have been quick to realize this situation, and due to their vision of service, it is possible to get replacement gears promptly and at much lower cost than if only a few parts were run through at one set-up. This is both a far-sighted and a foresighted policy that could be followed to advantage by many other types of manufacturers, who use gears in their products.

Passing to the third class, we have the Henry Fords of industry, who are in position to control their production, and can install highly specialized equipment that we gear men would not be justified in buying—not knowing how long we might have the business. These manufacturers have a stabilized design, with practically no changes in production that would make it necessary to discard considerable expensive equipment. With these we have, perhaps, little argument.

But there is a limit to the size of any one concern. We are all familiar with the unhappy experience of some of the big consolidations that have become top heavy and unwieldy. In these days of specialized production the old slogan, "built under one roof" loses the significance it once had. Even the Henry Fords do not make their own tires, and often not their springs, frames, ignition systems, etc. They recognize the fact that the specialist can frequently show them things they haven't thought of.

Specialists Give Best Service

Let us now consider the second class of gear users—that large group of manufacturers making equipment requiring gears in various quantities, some of whom are attempting to produce their own gears, with varying success. This group requires many different types of gears, these being supplied by as many classes of gear manufacturers. Most gear manufacturers specialize in one or two classes of work, but only a limited number have facilities covering a very wide range of gear production. In the final analysis, there are few of us whose business is actually competitive because if the fitness of each manufacturer to produce a certain class of gears were observed, there should not be much reason for anyone to seriously encroach upon the business of another. Economically, we should confine our activities to the work for which we are best fitted, from the standpoint of equipment and experience.

Some manufacturers in this group have had their own gear equipment from the beginning, while others have possibly been encouraged, by theoretical costs, to install gear-cutting machinery, on account of what they considered slow delivery, high price or some other form of poor service on the part of gear manufacturers.

It can frequently be shown that, economically, these manufacturers were not justified in the addition of a gear department, and some of the responsibility can be laid at the gear manufacturer's door. With a little

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more vision, we might have satisfied these customers, have saved them money, and incidentally, increased our own business.

All gear manufacturers have found an inclination on the part of some manufacturers to procrastinate about their gears until the rest of their equipment was practically ready for the gear installation. They then come to us for assistance and want deliveries "day before yesterday." This means rush delivery; picking up material anywhere we can get it promptly, with little opportunity to get the best prices. The work has to be rushed through the plant at an increased production cost, and frequently, I regret to say, at some sacrifice in quality.

The fact is that in many of these cases the manufacturer can purchase better gears at lower prices from one of the reputable gear manufacturers. The humor of the situation is that some of the makers of gear-cutting machinery find it desirable to purchase gears for their machines from the gear manufacturers.

How Home-Made Gears Actually Work Out

Very often, through lack of experience, the customer finds he cannot get the quality desired or as good as he had obtained from the gear manufacturer, who is a gear specialist and should be in position to supply just what the manufacturer needs and when he needs it.

In many plants it will be found that gear equipment is idle a large part of the time. Manufacturers won't stand for idle men around their plants; they discharge the men, but for some unaccountable reason they won't fire their idle machinery. Idle machines take up valuable floor space; they depreciate whether idle or busy; they require cleaning and attention; they must be insured, and in a dozen ways they help to increase overhead. Even with enough gear work to keep the machines busy 50 to 75 per cent of the time, there is a tendency for men to slow down so that the work will last for the full year. It is human nature that a man doesn't want to work himself out of a job. It is the productive hours that count, and to hold down costs where they should be, the man hours must be 100 per cent productive.

Slow turnover on material and labor investment is another factor. It may be that in order to have gears available when needed and avoid tying up too large an investment in equipment, the manufacturer finds he has to run through part of his gears months before he needs them. We have a good customer who builds machines requiring months to complete. This customer has gear equipment of his own, but within the past three years we have demonstrated that we can save him money.

Although he had a battery of gear cutters, in order to have all of the various items ready when needed it has been necessary for him to start producing gears in January for equipment that would not be completely assembled for shipment until September or October, perhaps December.

Frequently manufacturers have occasion to step up their production schedules. If they are buying gears from a dependable source they have much greater flexibility. Otherwise they might find it necessary to tie up additional gear equipment just to take care of this peak load. The gear manufacturer with better plant facilities and serving hundreds of customers can adjust himself to these peaks and valleys. He is a shock absorber both in times of over-production and under-production. Many manufacturers appreciate that during periods of depression the gear manufacturer is holding the bag rather than themselves.

How many manufacturers who install gear equipment realize that their machines, if used only part time, will possibly be obsolete as to method and efficiency long before they are worn out? In other words, they may be using machines that require more time for certain operations than the gear manufacturer who has more up-to-date equipment.

When the concern equipped for making its own gears uses only a few gears during the year, we sometimes find the superintendent of the plant, or perhaps a tool room foreman, running the gear machines. A few years ago the argument might have been that Bill or Andy wouldn't have been doing anything else anyway. But, most wide-awake manufacturers are no longer figuring costs in this way.

Sometimes, a manufacturer needs both ordinary gears and heat treated, or hardened, gears in the same machine. If he has no heat-treating facilities, he is tempted to use ordinary gears throughout and thereby lower the quality of his product. The gear manufacturer has a flexibility and a full range of service that can seldom be duplicated in any isolated plant.

Many manufacturers have come to the conclusion that they can use their capital more advantageously in exploiting their own sales than by having it invested in expensive gear cutting equipment. They are willing to let the gear manufacturer, the gear specialist, wrestle with the many intricate problems incidental to this business.

In view of these points, is there any good reason for a manufacturer in the middle group going to the expense of installing gear equipment? For throughout the country he can find experienced gear concerns, with ample facilities, who have devoted years of effort and study to the production of gears. With intelligent planning these gear manufacturers can give him what he needs in the way of quality and service, for less than he can produce his own gears. He can also consult with their engineers who will gladly give him the benefit of their valuable, accumulated experience of years spent in the gear business. We should not only be interested in selling gears, but should endeavor to give our customers the advantage of all we have learned about design, material, heat treatments, etc. Our aim should be to supply the gears most suitable for each particular application.

Many times we feel that the needs of the customer are probably quite different from the specifications submitted to us. Considerable tact is required on such occasions in making our recommendations, because it is not uncommon to encounter an engineer who is not convinced that we can show him anything about his gear installation.

Analyzing Customers' Needs

On a job of any size it is the practice of our company to analyze the data submitted with the inquiry, and if this gives us sufficient information about the application we can immediately proceed with estimates. Usually, however, the inquiry or specifications are not complete enough to indicate loads, speeds or operating conditions. They do not state what parts have given trouble previously or whether this trouble has been

due to breakage—all of which are pertinent. We then ask for this additional information, which should include assembly prints, and thus get quite a comprehensive history of the case which enables us to go about a complete and intelligent analysis. A little more time and work are involved but we find it very much worth while.

For example, a certain large manufacturer whose gear requirements are usually rather limited, decided several months ago to make some improvements and additions involving a quantity of gears. This was very attractive work and we were given an opportunity to figure on the job. While analyzing the specifications submitted, we found that we could save the customer money by making some changes. When quoting, therefore, we made two separate proposals, one on the basis of the specifications submitted and the other on our recommendation. This involved cutting down the pitch and width of face, enabling us to machine and heat treat the gears by means of special equipment used in producing gears for the automotive trade.

It took a little effort to satisfy our customer's engineers that the gears recommended would stand the gaff, but we sold them, and the installation has proved to be more quiet and more permanent than the customer thought possible. It may have seemed to others who figured on the job that our prices were low, but we made a fair margin of profit, and saved the customer several thousand dollars.

The Different Classes of Gear Manufacturers

This illustrate two points: that the gear manufacturer can be of constructive service, and that what he is able to do for a customer is dependent to some extent on the class of work that particular manufacturer is best equipped to handle.

There are also different classes of gear manufacturers.

There are some gear makers who are specially equipped for rush jobs, whose organizations are such that they can get started on a job almost immediately, as compared with the larger organization where this is not so easily possible.

Other concerns can handle larger quantities of gears to better advantage, specializing on cast iron or untreated steel gears, and not, therefore, needing heat treating facilities.

In another group we have the concerns specializing on certain classes of quantity work, either large or small gears.

In a fourth group might be placed those who are going after high-grade gears for applications where the greatest accuracy and strength is demanded, involving high-grade alloy steels, heat treatment, etc.

Economically, we should so far as possible confine our efforts to the work for which we are especially equipped, regardless of how badly we may need business. We do not want to overlook the fact that the A.G.M.A. is accomplishing much through its standardization work, and in other ways, that enables us to be of greater service to our customers. Few, I feel, outside of our own industry realize this.

Recently, a prominent machine-tool manufacturer asked if there wasn't some way of checking gear cutters. While explaining some of our methods for inspecting and checking various equipment necessary for producing high-grade gears it developed that this manufacturer did not realize the difference between gears cut by the rotary method, as compared with those generated on a hobber or gear shaper. Many manufacturers, even some building machine tools, have much to learn about gears. The average machinery manufacturer has so many other things to think about that we cannot reasonably expect him to know everything about gears.

It is possibly our own fault that the users of gears have not been more universally sold on the advantages of shifting to a reliable gear manufacturer the responsibility for seeing that they get gears that will perform with a maximum of efficiency in their equipment. Such a concern can give them gears that will stand up satisfactorily in service, that will often increase the value of their product and at the same time can relieve them of considerable worry and detail.

Constructive Service Possible

There is no question as to the need of the gear manufacturers, but as there is grief enough in the gear business without guessing at anything, we *do* need to be more thorough if we are to benefit by the opportunities that exist for being of constructive service. Let us try to analyze our customers' needs more thoroughly, even help them plan their production schedule if necessary. In this way we not only give the customer better gears, when he wants them, and save him money, but we can secure for ourselves the confidence of the manufacturers who need us as well as a better balanced production.

By planning farther ahead we can often bring through material for operations on special equipment that might otherwise have been idle, and avoid the periods of either feast or famine which so often have confronted us. We can also schedule operations for machines best suited for the particular work, and give the customer the benefit of time studies and more consistent piece work rates. Time is also allowed for the proper handling and inspection of material between operations. Fewer set-ups are necessary, which means gears more uniformly interchangeable and at reduced costs. We are then able to ship in car lots where the quantity justifies, thus saving freight and handling costs at each end. And finally the customer has gears when he needs them.

Service Saves the Business

May I, in concluding, tell of another interesting experience which illustrates some of these points. This particular customer's gear requirements aggregate nearly $100,000 annually and we have been supplying them over a period of many years. The purchasing agent, who is recognized as a very able buyer, had been placing orders as the requisitions for gears came through to him, as is customary. But, like the average organization, the requisitions frequently did not reach him until about the time the gears were actually needed, with the result that they were habitually ordering in small quantities and work in our plant had to be rushed without any time to analyze or study the customer's specifications. In fact, we did not have sufficient time to determine the best source for the material —it was just a matter of getting the quickest delivery. This meant that our production schedule was continually being thrown out of balance and it was frequently necessary to ship by express or even special messenger. All this ran up the cost of production and the situation was most unsatisfactory al around. For, although we were putting forth our best efforts to get the

material through, the customer was always more or less dissatisfied with the quality and service. Our sources of supply were becoming tired of being continually razzed for deliveries, and we could not plan our production intelligently. As things were going, regardless of the unusually friendly relations that existed, we were on the verge of losing the business.

We finally concluded that we must plan further ahead, and apparently the only way we could do this was to make an incentive for the customer to do likewise. We, therefore, went to our sources of supply, put the proposition up to them and sold them on the advantage of at least attempting to plan their production more nearly on a continuous basis. As a result we secured some very attractive material prices. With these as a basis, we worked up a schedule of prices for three months' requirements, with various price ranges, so that the customer could readily determine just what saving could be made if he could plan ahead. We sold them, too, and we have been planning in this way ever since with the result that everyone is better satisfied. On the strength of the first three months showing, the purchasing agent and his assistant who had helped work this schedule out with us, received a substantial raise in salary.

Filling Worn Tire Flanges

BY CLIFFORD H. FRENCH

Many master mechanics and general foremen in railway shops are both interested and puzzled in and about the problem of welding. There are more different opinions and experiences than there are welding apparatus or methods, and there is a lot yet to be learned on all sides. One of the puzzling problems is that of filling in worn tire flanges.

In one recent case I saw a driving wheel tire that had been in service but a short time after being welded, before it broke square across the tread and opened about two inches. It was as clean a break as you can imagine and as square across the tire as though it had been cut with a saw. There was no evidence of a flaw of any kind in the metal at the break. In this case the welding was done with oxy-acetylene, although many seem to prefer the arc for this work. The tires are not turned after filling. It is a crooked road and the flanges wear thin before the tread needs turning. A condition that makes it highly desirable to build up the flanges if it can be done safely.

It has been found that in building up the flange the heat of the welding flame enlarges the tire on the flange side so that the fit on the wheel is not as good as before. To overcome this, it is planned to use an oil heater clear across the rim, to preheat ahead of the welding, and so avoid the tendency to a slightly tapering bore. It is just possible that annealing after welding might also return the tire to normal.

Steel experts tell us that breakages of this kind are to be expected when we abuse steel by applying such intense heat as the oxy acetylene-flame or the electric arc, locally. They claim that the stresses set up in the metal by intense local heat cannot help affecting it seriously. On the other hand there are thousands of successful applications of these new processes without failure. But there are so many variables in the process, beginning with the operator and ending perhaps with the opportunity for the heated part to expand normally, that it is not yet a positive science.

Motor Shop Problems

Piston Pins

BY FRANK C. HUDSON

PISTON pins furnish many problems to the automobile designer and builder. Piston pins take the first blow of the explosion and are confined in the hottest part of the engine. The question of lubrication is important and it is rather astonishing that the oil spray, which is all most pins get, lubricates them as well as it does. Some pins have no oil holes at all, others have carefully drilled oil passages—and a few still have an oil pipe to carry the pressure feed from the crankpin to the piston pin.

The methods of making piston pins have undergone several changes in the past few years. Piston pins are, of course, all ground after hardening. But the use of the centerless grinder has made high production possible at very low costs. Some still maintain that the pins should be rough ground between centers to insure roundness, after which the centerless machine will finish them and retain the roundness secured by the centers. Others, however, and some who hold piston pins to a "two-tenths" tolerance in everyday work, contend that they can grind pins from the rough on the centerless and secure greater accuracy than by the center grinding method. And, best of all, they seem to get away with it.

CLOSE TOLERANCES ARE COMMON

The surprising feature of present-day automobile building is that we now find greater accuracy in the parts of the cheaper cars than the higher priced cars could boast of a few years ago. A tolerance of 0.0002 in. is adhered to in a few cases and 0.00025 in. to 0.0003 in. is to be found in many instances on piston pin work.

Machine lapping of piston pins is also becoming an almost universal practice and is used by builders of low priced as well as high priced cars. The finish which this leaves on a modern piston pin approaches perfection and far surpasses the high priced standards of a few years ago. Machines have now been developed which turn out excellent work that is not only smooth and pleasing to the eye but also very accurate. Some are securing better results by changing the pin end for end before the final lapping.

Centerless grinding is also widening its field of operation. Beginning with small pins and working up to the largest piston pins, machines are now at work on engine pistons and on brake shoes up to 8 in. in diameter. Brake shoes are ground from the rough casting, two passes usually clearing up and making them ready for future operations. In a few cases a third pass is necessary. The machine passes through from 5,000 to 6,000 brake shoes a day. Experiments on grinding pistons from the rough are also under way. If successful, this practice will take the place of rough turning, the piston being grooved and relieved over the pins before finish grinding. The finishing of the lands between the piston rings is a separate operation, as the body of the piston passes through the centerless grinder in the same way as piston pins.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A High-Speed Belt

BY RAY FLAGG

For driving the wheel spindle for internal grinding where the holes are very small, it is almost universal practice to use some sort of a fabric or webbing belt, on account of its very light weight and consequent low moment of inertia, which allows it to cling to small pulleys at exceedingly high speeds.

The writer has often used ordinary seam binding for the purpose, by stitching several layers together, but a few days ago he had his attention called to a belt made of ordinary web elastic. This belt performed decidedly better than any that ever came to the writer's notice. He has often tried belts made of solid rubber bands, but always found them entirely too heavy, having too much tendency to stand out like hoops and to lose contact with the pulleys. They also seemed to give the wheel an added tendency to chatter, due to their very elastic character. The elastic webbing does not seem to have this objectionable feature but runs very smoothly and will carry a considerable load. A good grade of elastic will last for a long time.

An Automatic Welder for Drive Shafts

BY CHESTER H. FRANKLIN

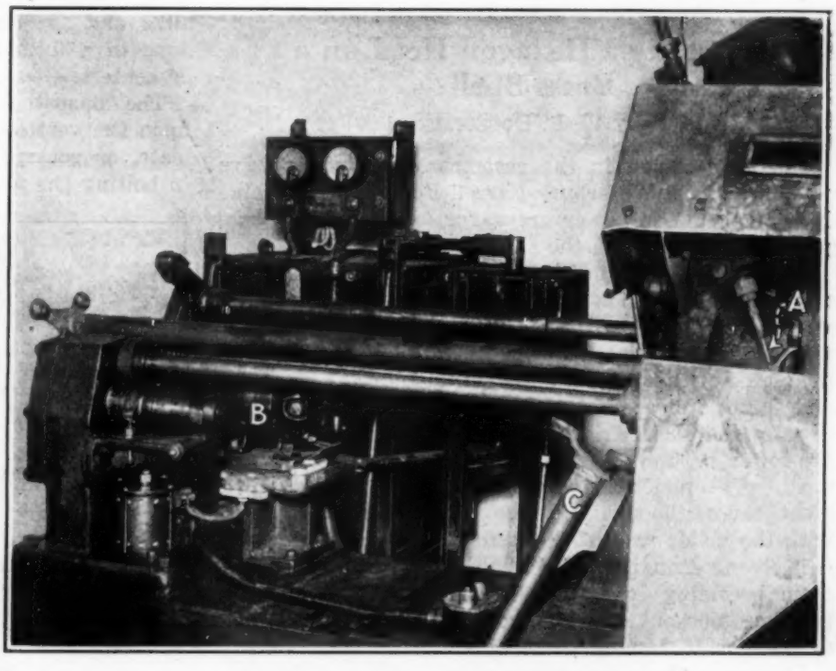
An interesting development of automatic welding was recently seen in the plant of the Maxwell Motor Car Co., and is illustrated herewith. It automatically welds the spiders on the ends of the tube which forms the propeller shaft, using the electric arc for this purpose.

The drop-forged spiders are machined to form pilots which fit into the tube end, the latter having been previously bored for a drive fit. The tube is seamless and specially heat treated, and the spiders are driven in with an air hammer. The end of the tube is also chamfered, so that the joints of the tube and the spiders leave a V-shaped groove for the welding.

The shaft is passed from the assembly fixture to the welding machine shown, and so positioned that the welding wire *A* is in proper position for making contact with the groove previously referred to. Normally, this welding compartment of the machine is closed to prevent the dangerously bright light from reaching the shop. The cover is controlled by a pedal and is easily operated.

The pedal is also connected with the switch, so as to prevent the current being turned on when the welding compartment is open. Upon releasing the pedal the compartment is closed and the operator presses the proper button which closes the welding circuit. As soon as the welding wire makes contact with the work, the feeding motor automatically withdraws the wire and establishes the arc. The roll-driving motor shown at *B* automatically then begins to rotate the drive shaft, which is clamped at each end between the rolls. A registering device, actuated by a solenoid in the same circuit as the roll-driving motor, allows the shaft to index one complete revolution, and then automatically opens a switch which interrupts the welding current. The work done has been very satisfactory and a welded tube-end is shown at *C*.

This machine, designed and built in the Maxwell plant, and almost entirely from available standard equipment, has made it possible to dispense with a skilled arc-welding operator and the awkward welding hood used by the individual. It combines the welding and assembling into one operation, which is performed in the open shop and in the line of progress of the material. The use of this machine has eliminated trucking to and from the welding department, and has made unnecessary the carrying of a large amount of work in stock, both tubes and spiders. It has almost doubled the production of a hand operator and gives a uniformity of product which is highly desirable.

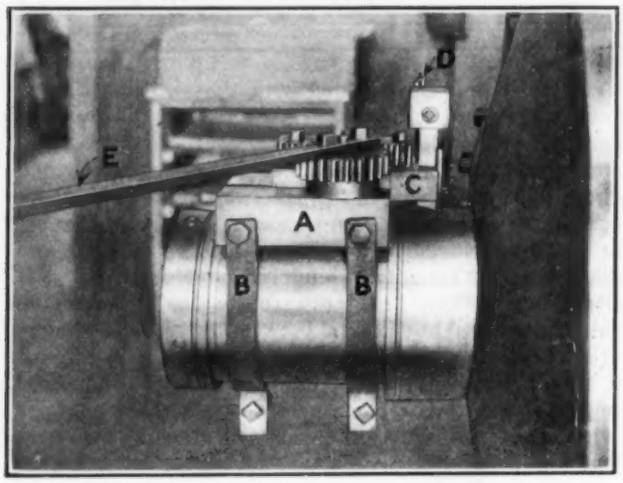


An automatic welder for drive shafts

A Keyseater for Close Quarters

By R. E. Marks

Cutting a keyway by the hammer and chisel has no place in modern manufacturing. And yet there are places where it is difficult to employ any other method. Such a case is shown in the accompanying illustration, where a keyway must be cut in the trunnion, near the



A Convenient Portable Keyseater

head of the drum which it supports. The usual method of milling, either with an end mill or with one which cuts on the periphery, can hardly be used, as the key must go very close to the drum head. So, to avoid cutting the keyway by hand, the device shown was made in the shop of the Asher Mfg. Co., Irvington, New Jersey.

The base of the keyseater *A* is held to the trunnion by the straps *B* and carries the ram *C* with its cutting tool. The depth of cut is controlled by the screw *D*, which feeds the tool. Motion is imparted to the ram by the lever *E*, through the rack and pinion shown.

Upsetting a Hexagon Head on a Brass Shell

By W. P. Doolittle

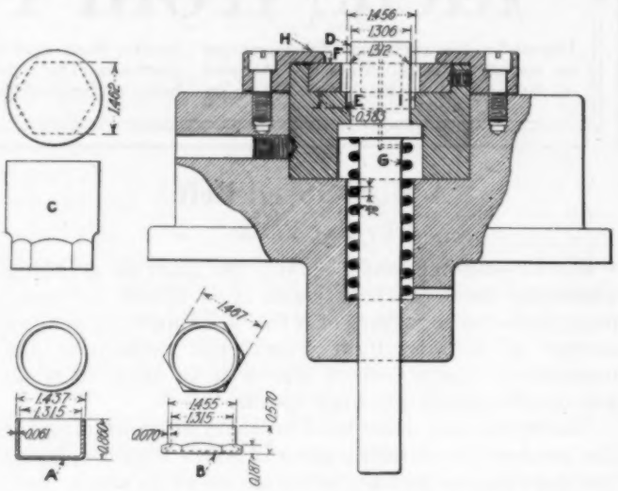
The tools shown in the accompanying drawing are used in a No. 6 Waterbury-Farrell Foundry & Machine Co.'s single-action power press, for upsetting the hexagon head as shown on the shell *B*.

The shell is cut and drawn in a double-action press and edged on a side edging machine to the length shown at *A*. After bulging, the shell is threaded internally.

The shell *A* is placed on the central plunger *D*. After the clutch of the press is engaged, the punch *C* descends and forces the shell *A* and plunger *D* down until the edge of the shell strikes the die at *E*, which restrains the lower part of shell from further downward movement. The punch in completing its downward movement, causes the shell to bulge until it comes in contact with the inside wall of the hexagon die *F*. The spring *G* is strong enough to prevent the closed end of the shell from becoming concave. As the punch ascends, the positive knockout comes in contact with the lower end of plunger *D*, forcing the shell from the die.

During the bulging operation, the side wall is thickened about 0.009 in. It is necessary to allow for this thickening by making the die large at *I*, otherwise the closed end of the shell would be distorted, due to the resistance offered to being pushed out of the die.

Parts *D*, *E*, and *F* are hardened and tempered, and the



Press tools for forming hexagon head on a shell

surfaces, which come in contact with the shell should be smoothly polished. Plunger *D* is made with a slight taper at the large end so the shell can be removed easily, the operator using a fork to pry it off.

The ring *H* is to prevent the dies from being pushed up during the process of extracting the shell.

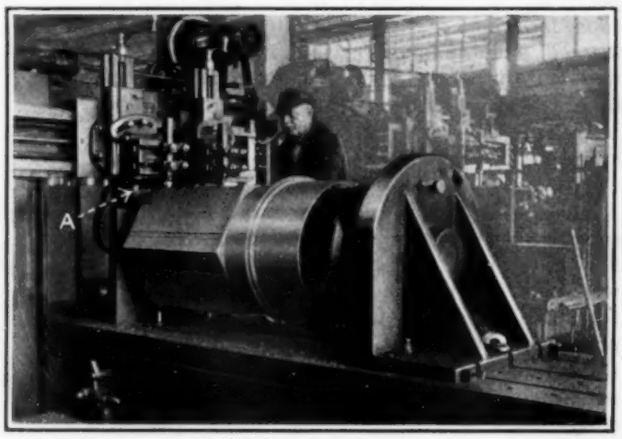
The punch *C* is hardened and tempered and made a close fit to the die *F*.

Fixture for Planing Large Work

By Jack Williams

The job shown in the accompanying illustration is a part of the Bullard Mult-au-matic. The planed portion is hexagonal in shape and, as the planed faces are all alike and are symmetrically disposed, the planing is done in a fixture that holds the work as if it were on centers.

The "headstock" of the fixture is a heavy angle plate, upon the vertical face of which is mounted a circular plate, or rotary table, having T-slots for convenience in bolting the work to it, means for clamping it firmly



Planing fixture and gage

to the angle plate in any position, and an indexing plate and locking pin to locate it exactly in any one of the six positions required by the job.

A similar, though smaller, angle plate supports the work at the opposite end. Mounted permanently upon top of this latter plate is the hardened-steel contour gage *A*, which is of the same shape as the faces to be planed. As the cutting tool or tools pass over this gage at each cycle of movement of the planer table, it is a practical impossibility to remove stock from the work at a point where such removal is not intended.

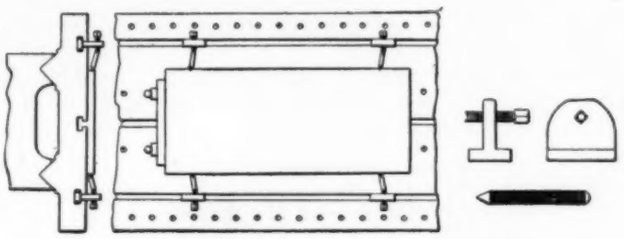
Even an accidental displacement of the tool could cause no damage to the work, as at the first forward movement of the planer table after such displacement had occurred, the tool, if in position to damage the work, would be dulled or broken by contact with the hardened steel.

A Simple Planer Accessory

By F. J. Wilhelm

An inexpensive and indispensable accessory with which every planer should be plentifully supplied is that shown in the accompanying sketch, used for the purpose of holding down work that is to be planed over its entire top surface at one setting, thus precluding the use of clamps, and in which holes for finger straps must not be drilled.

The T-shaped pieces to fit the slots of the planer table should be forgings, as cast iron of so small section will not stand the strain. They need not fit the



Screw Stops and Fingers for the Planer

slots too closely—indeed, it is better to have them quite loose, as less difficulty will then be experienced in placing them in the slots because of chips, and they will be held firmly in whatever position they may be placed when the sidewise pressure of the setscrew is imposed upon them.

The screws are the ordinary commercial cup-pointed setscrews, to be obtained from any machinery supply house at small expense. For most work screws ½ in. in diameter will be found suitable, but for large planers ⅝- or ¾-in. screws may be used.

The fingers used in conjunction with these screw stops may be made by breaking discarded round files into suitable lengths, rounding one end by grinding on an abrasive wheel, and sharpening them to a point at the other by the same means. The use of pieces of file obviates any necessity for tempering the fingers, as the hardness is no disadvantage except at the sharp point, and here it will be found more difficult to avoid drawing the temper on the grinding wheel than otherwise.

In use, the fingers should slant downward at a slight angle in order to force the work down tightly upon the table, and at an angle that will hold the work against the back stops.

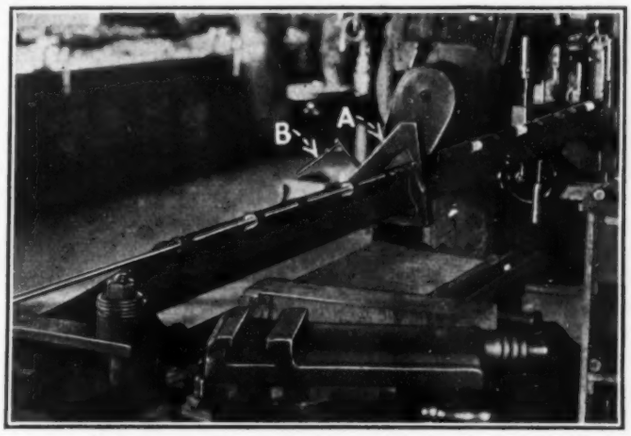
Drilling Twenty Holes in Line

By Clifford H. Trench

The story of the farmer who said he could easily line up two fence posts but couldn't get the third one in line, has something of a parallel in the machine shop. The difference is that it isn't easy to drill two holes and have them line up with our usual machine accuracy. When it comes to drilling twenty ⅛-in. holes and having them line up within commercial limits, it's quite an accomplishment.

Here is the way in which the Asher Manufacturing Co., Irvington, N. J., does the trick:

The rail shown is for use in an ironing machine and



Drilling guide for keeping holes in line

carries a number of swinging guides, or strippers, which peel the clothes from the surface of the ironing drum as it revolves. Fifteen strippers are hinged between the ears on the rail shown, though some rails carry as many as twenty strippers.

The drilling is done on an old engine lathe with the tailstock removed. The front end of the rail is supported on the lathe carriage and the other end leveled up and clamped to a suitable support. The drill is 8 ft. long and is guided by a bushing in the triangular frame *A*, which surrounds the rail to be drilled. The frame is clamped to the rail by the hand screw *B*.

Beginning at the left the guide frame is clamped on the frame just ahead of the first ear. After the first ear is drilled the guide is moved to the second ear. The first hole supports the body of the drill and the bushing guides the drill into the next hole. The drill passes through the hollow spindle of the lathe, being "fleeted" through the chuck and gripped at the desired point.

Mandrels for Winding Springs

By E. Wilson
Toronto, Canada

In many machine shops, the usual method of making springs is to coil them on a rod or mandrel in a lathe, the rod being held at one end in a chuck and supported at the other end by the tail center. In winding springs of very small diameter from comparatively stiff wire, the pull is so great that sometimes the metal surrounding the center hole in the mandrel is ruptured.

I would suggest that the end of the mandrel be pointed to an included angle of 60 deg., and supported in a cup center in the tailstock.

American Machinist
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KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

We Must Build More Planes

WHENEVER aviation is mentioned we point with well founded pride to the achievements of our Air Mail Service and to the work of the Army and Navy. They have all done splendid work and deserve more credit than most of us realize. For they have been and are handicapped by an insufficient number of planes, many of which are either obsolete or fast approaching that condition.

We have been preaching retrenchment and economy in order to reduce our burden of war indebtedness—and rightly. But as in so many cases, we have economized in the wrong place. Airplane development is one place where appropriations and orders should be greatly increased, and at once. Aviation originated in this country but we allowed foreign nations to get ahead of us in its development. We are now repeating our blunder by hampering its growth through the inadequate placing of orders for the air service in all its branches.

We have several factories that are well equipped to manufacture airplanes of various types, but unless orders are forthcoming in the near future, these plants will become a memory rather than an asset for emergencies. The specially trained personnel will be scattered and future production imperilled.

Those who object to increasing appropriations for the Army and Navy should bear in mind that the airplane is the only weapon used by either branch that has a distinct value in trade and commerce. The problems involved in ordnance, in battleships or in submarines are so special as to have little value in peaceful pursuits. Airplane development, however, has a direct bearing on commercial aviation, and unless we make it possible for the builders to maintain their organization by ordering airplanes in reasonable quantities, we shall be far behind in airplane development and dependent upon other nations in time of emergency.

What Kind of "Knitting" for Railroad Shopmen?

WHAT to do with the men in the shop, when there is not enough work to go around has been solved in a number of railroad shops (and some other shops as well) in a manner which the executive would never tolerate if it were money instead of men he had to deal with. Would he invest his idle capital in merchandise on which he is sure to lose? He would not. He would try to make some profit on it, however small, and, if he could not do this, he would let it lie idle.

If not enough work is coming in to keep the men busy at repairing rolling stock and other railroad material, some of them are put to making tools, and it is argued that these tools cost nothing but the bare material because these men would have been kept anyhow. That the tool is probably not as good as what might be purchased, and, that it will cause a loss on the operations done with it during its entire life time, is not considered. The men must be kept busy.

And yet if a few things were standardized in that shop, if tires could be bored and centers could be turned to a few standard sizes; if axles, boxes, connecting rods, cylinders, pistons and what not were held down to certain definite dimensions; it would be possible to make some of these parts for stock and during rush periods engines could be repaired more quickly because some of the parts required would be ready.

And this means also that fewer men would be required during the rush period so that fewer men would have to be diverted during slack times.

It is not reasonable to expect that the average man will be able to make good tools, that he will be skilled in many things besides his own daily work. When he makes tools, he makes them as an amateur. There was a time when the mechanic was supposed to be able to do anything that came along, and he lived up to expectations, simply because whatever had to be done was of a simple nature as we see it now. There were but few machines, few tools, few materials and few methods in existence. Such things as the art of heat treating a thousand kinds of steel was not dreamed of. It is highly probable that such a man, of whom we like to think as an extinct being of higher order, would be fired in a week if he were put in the tool room of a present day first class concern. Why then should we expect that a mechanic in a railroad shop can be converted overnight into a man who has the knowledge, skill and experience of the specialists who make our tools nowadays?

Don't ask your tailor to make you a pair of shoes. If you must keep him busy let him make you an extra suit. You'll need it some time.

Immigration—or Machinery?

ONCE more the important question of free admission or close restriction of immigrants is occupying the attention of Americans. To all appearances the question has been definitely answered in favor of restriction, only minor details remaining to be settled.

Such being the case it seems obvious that the correlated question, "Immigration or machinery?" has been answered in favor of machinery. An indication of the attention being paid to the latter question is given by the inclusion in the program of the annual meeting of the Chamber of Commerce of the United States of an address on the subject, "How Far Can Machinery and Better Use of Labor Supply Offset Immigration Restriction?"

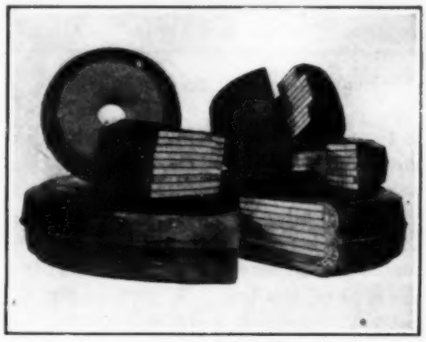
Economic laws act to make the business of building what Dean Kimball calls "The Master Tools of Industry," go through a feast and famine cycle, with the feast period short and the famine period long. Other economic laws, however, are going to help out the equipment makers for with immigrant labor shut off there can be no recourse of expanding American industry but machinery. Theirs will be the task of supplying the machines that will multiply the effort of the men available.

Shop Equipment News

"Rubwood" Industrial Truck Wheels

The Rubwood Wheel Co., Monson, Mass., is now marketing combination rubber and wood wheels in a variety of sizes and styles. These wheels are particularly adapted for industrial truck service, and a number of them are shown in the accompanying illustration with sections cut out to reveal the internal construction.

The body of the wheel is made from a series of thin wood disks, between which layers of rubber are



"Rubwood" Industrial Truck Wheels

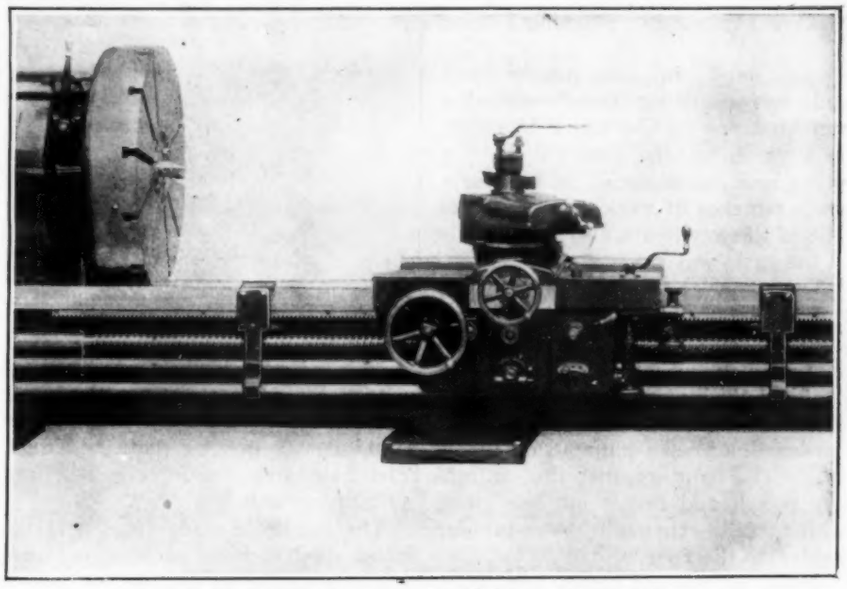
placed by a method that causes the rubber to impregnate the surfaces of the disks and form a very strong bond The rubber tread is then built up on the combined wood and rubber center, forming the complete wheel.

As is usual in manufacturing laminated wood articles, the grain of the wood in adjacent disks is caused to run in different directions in the finished wheel, preventing warpage and providing the maximum strength. The wheels can be furnished in any size, width or bore desired, and the thickness and shape of tread can be provided to suit given conditions. It will be noted from the illustration that the various wheels have different treads, the large wheel, which is for use on electric trucks and trailers, having fabric in its tread.

These wheels are said to be exceptionally resilient and to provide excellent wearing qualities. The wheel center is quite elastic under the heavier loads and this feature tends to decrease the liability of breakage even under the most severe conditions. The economical manufacturing methods developed for these wheels will, it is stated, reduce wheel costs on industrial truck equipment materially.

LeBlond Self-Spacing Lead Screw Supports

Lathes with a 25-in. swing and over, made by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, are now being marketed with an improved type of self-spacing lead screw supports. The carriage in its travel along the bed automatically engages such supports as it may come in contact with, carries them to the end of its travel and, upon return, releases them in their respective original positions.



LeBlond Self-Spacing Lead Screw Supports

Each support is provided with a spring-controlled hook pawl that engages a locking stud on the carriage, or on the adjacent support if more than two supports are used. The pawl and locking stud provide a positive connection between the supports and the carriage that will stay in engagement until released.

Each pawl carries a release pin that contacts with a pin located in the bed at the release position. The contact of these pins immediately disengages the pawl from the locking stud, the support being left in its proper position.

This type of support holds the lead screw in position at proper intervals and, in addition, supports the feed rod and the spindle control rod. The supports are heavy in section and have babitted bearings of ample size for the rods and lead screw. Lathes with bed lengths from 16 to 24 ft. are regularly equipped with two supports; beds from 26 to 34 ft. long have four supports; and for each additional eight feet of bed two supports are furnished.

Kimball Brake-Band Relining Machine

The Kimball Garage, 139 Ashmun St., New Haven, Conn., has recently placed on the market a device for removing old linings from the brake-

bands of automobiles and replacing them with new linings

The device consists of a floor stand and column having at the top a C-shaped frame with two stationary

Kimball Brake-Band Relining Device

anvils fixed in the upper jaw and corresponding treadle-operated punchholders in the lower member. The punchholders are tubular in shape and are designed to hold separate punches of various sizes. The tips of the anvils are also replaceable in the same way.

To remove the rivets from a worn lining the punch is removed from one punchholder and placed in the corresponding upper member. With the brake-band resting upon the open end of the punchholder, which is case-hardened, a pressure upon the treadle raises the band against the stationary punch and forces out the rivet, which falls through the tubular holder to the floor.

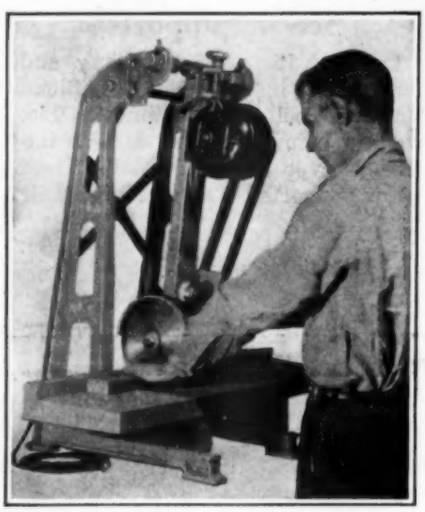
When all the old rivets have been removed the punch is again placed in the holder and an anvil tip with a receding pilot is fixed in the upper member. With the new lining adjusted to the brake-band, the latter is placed over the punch, located in correct relation to the hole in the band by the protruding pilot in the anvil, and the treadle is again depressed. This action punches and countersinks a hole in the new lining, the hole in the brake-band acting as the die.

The rivet is then set in place and the band transferred to the opposite side of the device, where a pressure upon the corresponding treadle upsets the rivet and completes the job. The advantage of the device is that all of the work is done upon one machine with but two loose parts.

H & A Woodworking Cut-Off Saw

A recent addition to the line of woodworking equipment manufactured by Heston & Anderson, Fairfield, Iowa, consists of the No. 5 portable electric swinging cut-off saw, shown in the accompanying illustration. The machine has sufficient capacity to handle wood 2 in. thick and 12 in. wide.

The machine is self-contained and can be connected to an ordinary lamp



H & A Woodworking Cut-Off Saw

socket. A standard 18-gage cut-off saw, 8 in. in diameter, is used and runs at 2,100 r.p.m. The ¾-in. saw spindle runs in long plain bearings. The saw and its driving belt are suitably guarded.

The swing is made from a structural steel channel section and carries the motor on a slide, so that it can be moved to tighten the belt. A snap switch for the motor is conveniently located and the weight of the motor balances the swing, so that no springs or counterweights are necessary to return the saw to its position at the rear of the table.

A ½-hp. Emerson motor provides the power for driving the saw and can be furnished to suit current conditions. The frame of the machine is cast iron and is of the proper height to be placed on the work bench. The machine weighs 155 pounds.

"Trump" Belt Lacing Machine

A belt lacing machine that not only attaches a helical steel wire lacing to the end of a belt, but is also used for making the coiled wire helix itself, is now being marketed by the C. I. Wroe Co., Room 1514, Pershing Square Bldg., New York, N. Y.

The machine is shown in the accompanying illustration and is illustrated when being used to punch a line of small holes across the end of the belt. A wire helix is shown on the base of the machine and this

"Trump" Belt Lacing Machine

is threaded into the punched holes in the belt by hand. The belt with the wire in place is then transferred to the other side of the machine where the coil is flattened out so that a series of flattened loops project from the end of the belt. A series of pins in the machine hold the loops in alignment as they are flattened and insure the proper meshing of the loops on each end of the belt as they are brought together.

The other end of the belt is then treated in a similar manner and the final connection of the belt is made by a rawhide pin passed through the wire loops. The arbor shown at the right of the machine is used to make the small coils. This arbor has a slotted end into which the wire is inserted and the arbor is then pushed into the hole in the frame of the machine above the punch and to the left of the rocker. As the arbor is rotated, the wire follows a helical groove in the hole and the coil is quickly and easily made, ready for immediate use.

The finished joint is flexible and the wire coils are flush with the belt surface when flattened. Among the advantages claimed for the device are simplicity of construction and operation, economical operation, and speed. Wide belts can be laced by punching the holes part way across and then shifting the belt in the machine.

News of the Week

United States Chamber of Commerce Hold Annual Meeting in Cleveland

Barnes re-elected president; many prominent speakers

Larger attendance and a more varied program than formerly were the two features that characterized the twelfth annual meeting of the United States Chamber of Commerce held in Cleveland, May 6, 7 and 8. Members from all parts of the world were present and such nationally known speakers as Herbert Hoover, Julius Barnes, Sir Esme Howard, Edward Filene and many others addressed the members either at general sessions or in group meetings.

Julius Barnes was elected president for the third consecutive term. Lewis E. Pierson of New York and John W. O'Leary were elected vice-presidents. Seventeen new directors were also elected. They are the following: Richard F. Grant, Cleveland; Frederick J. Haynes, Detroit; James S. Kemper, Chicago; Felix McWhirter, Indianapolis; Alvan T. Simonds, Fitchburg, Mass.; Ernest T. Trigg, Philadelphia; John M. Crawford, Parkersburg, W. Va.; M. J. Sanders, New Orleans, La.; John W. Shartel, Oklahoma City, Okla.; John W. O'Leary, Chicago; William J. Dean, St. Paul; Lafayette Hanchett, Salt Lake City; O. M. Clark, Portland, Ore.; Arthur S. Bent, Los Angeles, and Robert R. Ellis, Memphis, Tenn.

Among the many important matters discussed this year were the Japanese exclusion law; the Dawes plan; and the U. S. Senate's action regarding tax reduction.

The Division of Meetings

Following the usual custom the Chamber held general sessions in the morning and evening, and group luncheon meetings at 1 o'clock in the afternoon. The morning of the first day was taken up by the address of welcome delivered by Edward B. Greene, president of the Cleveland Chamber of Commerce, the appointment of committees, receipt of reports, and the annual address of President Barnes. The group meetings on the first day were devoted to domestic distribution, department of manufacture, finance, and transportation and communication. The informal dinner in the evening was given over to the American Trade Association executives who were present at the convention in large numbers. Secretary of Commerce Hoover spoke at this meeting. His speech appears in another part of this issue.

Another general session was called in the evening when Sir Esme Howard, Ambassador Extraordinary and Plenipotentiary of Great Britain, delivered the first address. Other speakers at this session were Curtis D. Wilber, Secretary of the Navy, and General Herbert M. Lord, director, the Bureau of the Budget, Washington, D. C. An organ recital was given prior to the meeting through the courtesy of the Cleveland Chamber of Commerce.

Work, Even at Breakfast

Following a breakfast for presidents and secretaries of organization members, the general session of the second day was opened with President Barnes in the chair. Speakers at this session were: Dr. H. A. Morgan, president of the University of Tennessee, Knoxville, Tenn.; Alfred Stone, Dunleith, Miss., and Dwight B. Heard, Phoenix, Ariz. Group meetings were devoted to civic development, foreign commerce, insurance, natural resources production, and transportation and communication. The informal dinner on Wednesday was held by the National Association of Commercial Organization Secretaries. The general session in the evening had for speakers, Basil Miles, Administrative Commissioner from the United States to the International Chamber of Commerce, Paris, France, and Edward Prizer, chairman of the board, the Vacuum Oil Co., New York City.

General J. J. Carty, chief engineer of the American Telephone & Telegraph Co., New York City, spoke at the Thursday morning general session from his office in Washington, D. C., through the telephone and his speech was broadcast to the audience by loud speakers. Col. George T. Buckingham, of Defrees, Buckingham & Eaton, attorneys, Chicago, and Judge Edwin B. Parker, umpire, Mixed Claims Commission, Washington, D. C., were the other speakers.

No group meetings were held on Thursday but in the afternoon a general session, when the election of officers and directors was held, and the consideration of the resolutions was taken up was on the schedule.

Among the resolutions were: disapproval of the Japanese Exclusion Law; approval of American adherence to the International Court of Justice; disapproval of the Simmons tax plan, and indorsement of a national peace time mobilization of industry for war.

"The swelling volume of American production and distribution rose last fall to its unprecedented crest, recording 23 successive weeks of railroad car loadings exceeding a million cars a week," said President Barnes in his annual address. "In the face of continued instability and unsettlement in Europe, the American tide of commerce distribution, sustained by the buying power of a fully employed people seemed capable of indefinite maintenance and continued expansion. The great engine of American large scale production, developed by industrial methods and practices peculiarly American, seems illimitable in its ability to take the suggestions of inventive minds, provide great quantities of new and old articles of living use, and by this very process, enlarge and strengthen the earning power of our people and their ability to purchase and possess.

"And it is America's buying that sustains the industrial and financial structure of the countries that produce silk, or rubber, or coffee—articles which we do not produce at home, because of climatic and soil conditions.

"How efficiently this industrial mechanism is functioning and how adaptable it has become to every device that serves it with economy, is again shown by the general statement that this six per cent of world population (the United States) owns almost half the railroad mileage of the world, and almost three quarters of the telephone and telegraph equipment. Moreover, it produces and uses at home about 90 per cent of the world equipment of automobiles.

Railroads and Their Prospects

"The machine equipment of industry, however, developed the need of additional capital ventures into industry, if that modernizing and expanding was to continue. The railroads during 1923 expanded in new equipment and improvement over a billion dollars, and as a result, for the first time in years, America had adequate and ready transportation, which of itself proved a great safegurad to the operations of industry and the welfare of all our people. But this railroad capital was secured with fixed charges lacking the flexibility and elasticity of stock ownership ventures, which latter would have required the hope of better capital returns in event of successful enterprise."

Mr. Barnes also touched upon the various phases of national life in which the Chambers of Commerce are interested and then took up the following subjects: "Progress of the Chamber", "European Conditions", "Transportation Study", "The Postal Service", "Veteran Care", "Agriculture", "Business Ethics", and "Contact with Government Departments."

F. M. Feiker, vice-president of the Society for Electrical Development was one of the speakers at the domestic distribution group meeting. He urged

market censuses so that distributors could tell the exact condition of markets and buyers generally.

Another speaker at this session was Edward A. Filene, president of the William Filene's Sons Co., Boston. He advocated mass buying and the formation of chain groups of merchants to overcome the growing tendency of chain stores and mail order houses. He stressed the present cost of distribution as being one of the causes of high prices. Mass buying and mass distribution would be of much service to the American people, he stated.

In the department of manufacture group meeting Arthur H. Young, manager of industrial relations, the International Harvester Co., Chicago, stated that a marvelous transition had taken place in industry during the past five years and that today the relationship between employers and employees is on a basis of better production, and better conditions and is generally satisfactory. Nothing is more needed than "industrial justice" to assure industrial harmony in its highest sense, asserted Mr. Young.

"BUYERS' BIBLE"

Dr. George K. Burgess, director of the Bureau of Standards, Department of Commerce, Washington, D. C., was also a speaker at this group meeting. He stated that the completion of the "Buyers' Bible" would be effected before long and that the department would then be able to furnish a handbook of specifications for the guidance of purchasing agents of the government and of private industry.

At the group meeting on transportation and communication, Col. Paul Henderson, Second Assistant Postmaster General, told of the air mail development and the growth of the parcel post service during its few years of existence.

Lucius Teter, of the Chicago Trust Co., Chicago, Ill., told of the work of the Postal Service Committee of the Chamber of Commerce and recommended that gradual increases be given employees where needed, rather than the blanket increase that has been proposed in Congress.

The success of arbitration was emphasized by Dr. H. G. Taylor, president of the National Association of Railway and Utility Commissioners.

"To continue the hostile attitude between the public and the transportation systems and expect a happy and prosperous nation is as foolish as to expect a happy family to exist where there is hatred between its members", stated Dr. Taylor in urging more wholehearted co-operation between the railroads and the public.

Col. George T. Buckingham of Defrees, Buckingham & Eaton, Attorneys, Chicago, Ill., spoke at the general session Thursday morning on the duties and responsibilities of trade associations. He reiterated Herbert Hoover's summing up of the situation and stated that it was obvious that associations were needed for the distribution of statistics, credit information, production economies and other things which lowered the cost of the products manufactured and were thereby a benefit to all.

Speakers at Motor Transport Congress

The use of motor trucks by railroads and the use of buses by street railway companies are to be two of the important subjects to be discussed at the World Motor Transport Congress at Detroit May 21 to 24. Railroad men from abroad will be present, as well as a score or more of executives from the railroads and street railways of this country.

An address on "Adjusting the Motor Vehicle to Railway Requirements" will be given on May 21 by Sir Henry Worth Thornton, K.B.E., chairman of the board of directors and president of the Canadian National Railways. It is expected that under this subject door-to-door delivery as now practiced in Canada, will be discussed.

"The Place of the Motor Bus in World Transportation" will be the subject of another address on the same day. Discussion will follow on "How Are Motor Buses Being Developed to Meet International Needs," led by H. Weinberger, representative of A. Fross-Buessing of Vienna, Austria. John Hertz, president of the Yellow Cab Manufacturing Co. of Chicago, will speak on "The Taxicab in Its Economic Sphere," and S. Audi, president of S. Audi et Freres, Beyrouth, Syria, will discuss "How Is the Motor Vehicle Changing Local Transportation."

More than 100 delegates from abroad are expected at the World Motor Transport Congress, in addition to hundreds from this country representing, as well as the automobile and motor truck, the Government, railroads, street railways, and others interested in the industry.

Urge Simplification of Piston Ring Sizes

Reduction of the present great diversity in sizes and dimensions of piston rings for automobile motors is urged by the ring manufacturers as a means of eliminating avoidable waste in the production and distribution of these commodities.

Firms interested have requested the co-operation of the Division of Simplified Practice of the U. S. Department of Commerce in their efforts to rid themselves of the burdens now imposed on them by the huge assortment of sizes which the manufacturers carry in order to serve the motoring public. One manufacturer produces over 3,000 separate and distinct sizes of piston rings; another makes close to 5,000 different rings, and still another stocks over 8,000 different sizes. These include, of course, the so-called "regular" sizes, and also a line of oversizes for use with re-bored cylinders. With this tremendous variety, it is pointed out, the manufacturers must keep on hand total stocks aggregating three to five million rings in order to give service as and when wanted by the trade. Obviously, some of the sizes, though seemingly necessary from a service standpoint, are seldom called for, maybe not once in six months to a year. This results in slow turnover, heavier carrying charges for these large inventories, including interest on idle investment, depreciation, and obsolescence, with consequently greater costs of doing business. Prices to the ultimate consumer are proportionately higher under these conditions of excessive variety than would obtain if fewer sizes and dimensions were acceptable to the engine and motor car builders.

The ring makers recognize that the initial corrective effort must come from the engine designers and builders. That many of the engineers are in sympathy with the idea of fewer sizes is evidenced by the suggestions regarding desirable simplifications recently made by the members of the American Society of Mechanical Engineers to the American Engineering Standards Committee and relayed by that body to the Division of Simplified Practice. Those suggestions include not only automobile motor cylinder bores, and piston ring sizes, but also other automobile parts such as spark-plugs, ball bearings, springs, tires and rims, etc. The Society of Automotive Engineers has developed standards for over-size cylinders at ten, twenty, thirty, and forty thousandths of an inch over the original diameter of the cylinder. These oversizes are fairly well adhered to, but the real cause of the excessive variety in ring sizes is said by the ring manufacturers to result from the wide range of cylinder bores used in motor construction.

S. A. E. Will Not Have Machine Tool Exhibit

The machine tool exhibit that was to have been held in conjunction with the production meeting of the Society of Automotive Engineers in Detroit, Oct. 22, 23 and 24, has been abandoned. The Council of the Society decided against the holding of the exhibition after a study of the situation.

The action is not to be interpreted as a reflection of disfavor toward the exhibition as such, but merely as the judgment of the Council that the Society lacks the personnel and the time to enter the exhibition field. This cancellation will not affect the professional activities of the S.A.E. and several meetings are being arranged to discuss production engineering subjects.

Screw Thread Commission Meets May 28

Finishing touches will be put on the revised screw thread report at a meeting of the National Screw Thread Commission in Cleveland, May 28. Following the meeting, the report will be sent to the printer.

The Plain Gage Committee will meet in Cleveland, May 29, to act on the suggestions which have been made to it in connection with its tentative report. These suggestions will be accepted or rejected at the Cleveland meeting, immediately after which the report will be submitted the American Engineering Standards Committee.

National Council of U. S. Chamber Votes Against Metric System

Cost of change and confusion in adoption pointed out

During the twelfth annual meeting of the Chamber of Commerce of the U. S. the National Council of the Chamber met at the Hotel Statler to consider subjects presented to it by the board of directors.

One of the topics for consideration was stated as follows on the program: "Advice to the board of directors respecting the timeliness of a referendum on the metric system."

In presenting this topic to the meeting, at which were present between 400 to 500 councillors, the secretary to the chairman briefly reviewed the various steps which had been taken during the last few years by the Chamber in the consideration of this question. He mentioned the fact that a committee had been appointed, that this committee at the Washington meeting of the Chamber on Feb. 9, 1922, brought in an extended report giving arguments for and against metric adoption. At that meeting the councillors after hearing speakers on both sides of the question advised the board of directors to the effect that the time was then not opportune for the holding of a referendum.

At a request from the floor the secretary here read the list of the members of the committee mentioned above.

Continuing his remarks the secretary explained that the request for a referendum had been placed before subsequent meetings, but that the board of directors had declined to act because in their opinion the holding of a referendum was then not timely. Now this question had once more been brought to their attention by a member of the Chamber, the Foreign Trade Club of San Francisco.

The Motion Presented

The chairman then gave the floor to Clifton Hildebrand, representing the Foreign Trade Club who presented a motion to the effect that the board of directors be advised to submit to the membership at large a referendum on the question of the advisability of compulsory metric legislation with the statement that the present was an opportune time to ascertain the country's attitude on this question.

In support of his motion, Mr. Hildebrand delivered an extended speech claiming the present extended use of the metric system in industry, resolutions in its favor passed by many organizations and the attitude of Mr. Ford and Mr. Edison in its support.

The next speaker was E. F. DuBrul, secretary of The National Machine Tool Builders' Association, Cincinnati, Ohio. In a logical, well considered address delivered with much force he spoke against the motion and the metric system. He showed the absurdity of imposing on industry a system incommensurable with our present system on which our vast standardization is based. Referring to the building in which the meeting was held he pointed out that as long as it and others more pretentious remained in existance any replacement from a window pane to a pipe elbow would have to be carried in stock should the metric system be imposed on this country. He related his personal experience in one of the South-American countries, legally metric, where, after having painstakingly translated a drawing from English to metric terms he was obliged to discard the metric dimensions and re-write the English ones because the machine shop which was to make a certain piece only used English dimensions.

Would Cause Confusion

He pointed out the inevitable confusion of a dual system in place of present uniformity and voiced industry's objection to the burden of metric legislation. He accused the manufacturers of being too lax in fighting metric propaganda. His address was frequently interrupted by emphatic applause. When he resumed his seat the applause was long sustained.

A representative of the packing industry declared strongly against metric adoption. He pointed out that this industry was closely identified on the one hand with the farmers and on the other with the individual consumer neither of which would accept a change. He spoke of the perplexities of a dual system by saying that for the few instances where they were obliged to bill their goods to metric terms they found it necessary to hire a special artist to do the translating from one system to the other.

The next speaker represented the drug manufacturers who he declared were opposed to the use of the metric system. In spite of all efforts made to educate dealers and manufacturers of drugs it was found impossible to put the metric system over, as he expressed it.

A councillor from St. Louis speaking for an organization representing men in practically all walks of life voiced opposition to the motion. Others were ready to speak against the motion, the chairman, however, evidently considering that sufficient time had been allotted to that side asked the proposer of the motion to speak in closing.

In doing so Mr. Hildebrand admitted that the contemplated change would call for expenditures. He claimed that the side he represented had never expressed themselves to the contrary. Such a cost, however, would be overcome by the benefits accruing in the future. He closed his remarks by asking for favorable action on his motion.

Upon vote the motion was defeated by a large majority.

Prominent Speakers on Industrial Preparedness

Bernard Baruch, Newton D. Baker and Assistant Secretary of War Dwight F. Davis will be the speakers at the Industrial Preparedness session to be held in Cleveland on Wednesday evening, May 28, during the spring meeting of the American Society of Mechanical Engineers. The Aeronautic and Ordnance session will attract officers from all over the country and the Industrial Preparedness session will have a full audience of men interested in maintaining peace for the nation through industrial preparedness as an insurance against war.

Auto Selling Reported Much Better

Although manufacturers of motor cars in general report an increase in sales during the last few days, production figures for April show a sharp falling off compared with March, and with April a year ago.

General Motors reports 57,000 cars sold in April against 73,756 in March, and 75,822 cars in April last year. These figures, according to an official statement, represent the sales of Buick, Cadillac, Chevrolet, Oakland, Oldsmobile passenger cars and GMC trucks, by the domestic and Canadian divisions of the company. Chevrolet production alone was 33,757 cars for April, against 46,826 cars in March, and 36,000 cars in April last year. The production schedule for this month is put at 37,500 cars.

The New York branch of the Packard Motor Car Co. reports sales for April of 443 cars valued at $2,200,000, a new high record in number and value. In the same month last year the branch sold 433 cars valued at $1,900,000. Sales since Jan. 1, 1924, according to Lee J. Eastman, president, were larger than for the same period last year. The business in the New York territory represents between 15 and 20 per cent of the company's output.

According to reports from Detroit the retail deliveries of the Ford Motor Co., for the second ten-day period of April, averaged 3,000 cars more than in the first ten-day period of the month, the figures being 9,600 and 6,600 respectively.

The Willys-Overland Co. turned out approximately 20,000 cars last month against 24,891 cars in March, and 18,648 cars in April last year. The company reports operations at capacity, approximately 800 cars daily. Dodge Bros. report retail sales of 6,000 cars for the week of April 19, a record for the current year. The Hupp Motor Car Co. reports that dealers reduced their stocks by 400 cars in the week of April 26. The closing week of April was a record for sales reported by the Paige-Detroit Motor Car Co.

Buffalo S. A. E. Elects Officers

The following officers have been elected by the Buffalo section of the Society of Automotive Engineers: Chairman, J. W. White, the Wire Wheel Corp. of America; vice-chairman, E. T. Matthewson, the Nichols & Wright Motor Co.; treasurer, Harold Youngren, the Pierce-Arrow Motor Co.; secretary, L. H. Pomeroy, the Aluminum Co. of America; committee on papers, O. M. Burkhardt; the Pierce Arrow Motor Co.; committee on public relations, H. Gardner Jackson, Wire Wheel Corp.

Plans Complete for A.S.M.E. Meeting

Post-war advances in aviation and ordnance, power problems of steelmaking, development of scientific management in industry and new and expanding spheres of manufacture, transportation and education, will be discussed by leading authorities from all over the country at the five-day spring meeting of the American Society of Mechanical Engineers, which opens in Cleveland on Monday, May 26.

Expansion of organized engineering in the field of public service will be stressed at several sessions by speakers representing the industries, army and research laboratories of the nation, according to an announcement made by the President of the society, Fred R. Low.

More than 1,500 engineers, economists, educators, industrialists and officials of State and Federal services will, President Low said, herald a striking progress since the war in practically every phase of activity in which the American Society of Mechanical Engineers enters.

President Low will head a New York delegation numbering over 200. Engineers from many of the largest industries of this and other Eastern cities will deliver addresses. Practically all of the Eastern universities will send representatives.

A feature of the program is the industrial preparedness dinner on Wednesday evening, when addresses outlining the War Department's plans for co-operation with industry will be delivered by leaders in the movement.

Auto Accessories in Australia and Egypt

Although the wide use of imported accessories in Australia is somewhat impeded by heavy customs duties, American lines have the best sales, especially spark plugs, piston rings, carburetors, storage batteries, and magnetos. With reference to non-essential accessories, American makes of shock absorbers, spotlights, timers, brake linings, and warning signals are preferred; bumper bars, windshield wings, step plates, rubber mats, and fan belts are made locally. In most of these articles, excessive duties allow local makes to compete with American, but since 85 per cent of the cars in use here come from the United States and Canada, the great majority of car owners prefer American products. Standard types of servicing equipment are in general use, although the average garage man employs what in the United States would be considered meager equipment. With the ever increasing volume of imports of all automotive products the future for American automotive accessories is very bright, says Trade Commissioner J. W. Sanger, who has just returned from Melbourne.

In 1923 for the first time, American-made spare parts for motors, motor cars, and motor cycles imported into Egypt exceeded those from any other country, says Consul E. L. Ives, Alexandria. For the first eleven months of the year total importations of such articles were valued at $474,250, of which the United States supplied $144,640 and the United Kingdom $133,785. During the corresponding period of 1922 the total imports were $370,353, of which the United States supplied $88,061 and the United Kingdom $126,143. At present, despite the popularity of American products, the demand for German makes is increasing. Prices charged by local garages and sales houses are excessive, the dealers appearing to feel that they should exact as much profit as possible. Servicing equipment, other than 29 sidewalk gasoline pumps in Cairo is practically unknown, native labor being cheap. Automobile agents in Cairo and Alexandria are the chief distributors, and themselves sell large quantities of accessories at retail.

Machinery Buying Gains in Central America

Exports of industrial machinery from the United States to Mexico declined approximately 11 per cent in 1923. Last year's figures for Mexico and all Central American countries, however, have fallen only slightly below those of 1922, the decrease experienced in the Mexican trade being almost exactly compensated by increased exports to other Central American countries especially Nicaragua, Guatemala, and Panama. There is a difference of less than $1,000 between 1922 and 1923 figures of total industrial machinery exports to the Mexican and Central American group.

Considering Mexico alone, the principal decline occurred in the miscellaneous machinery classification, which fell off about 22 per cent during the past year. Construction and conveying machinery, however, increased 22 per cent over 1922 figures. Other increases occurred in the metal-working machinery group, and a slight increase was recorded in exports of textile sewing and shoe machinery.

Mexico's decline of $914,133 in 1923 has lowered its position to fifth place as a market for American machinery. In 1922 Mexico ranked fourth, absorbing $8,741,456 worth — a marked decline from 1921 figures, when it stood in first position with exports from the United States amounting to $30,784,076.

The increases of industrial machinery exports to Panama, Guatemala, and Nicaragua resulted in nearly offsetting the 1923 decline of exports to Mexico. The exports to Nicaragua almost doubled in 1923. The erection of sugar mills and the development of the banana fiber industry is given as a reason for this increase. The City of Bluefields, Nicaragua, is expanding industrially and has needed American machinery in its development.

Machinery exports to Costa Rica showed a slight increase in 1923, while similar figures for Honduras showed an excess of nearly $100,000. Machinery exports to Salvador decreased slightly under the 1922 amount.

Cars Being Bought by Railroads

A detailed statement of the $62,000,000 worth of equipment which the New York Central, the Michigan Central, the Big Four, and the Cincinnati Northern Railway expect to purchase is as follows:

N. Y. C.: 50 H-10 Mikado freight locomotives, to be built by the American Locomotive Co., $4,009,850; 50 U-3 eight-wheel switching locomotives, the American Locomotive Co., $1,845,400; 35 steel passenger coaches to be built by the Pullman Co., $974,015; 35 steel passenger coaches to be built by the Standard Steel Car Co., $695,500; 15 steel passenger coaches to be built by the American Car & Foundry Co., $417,210; 16 steel dining cars, the Pullman Co., $768,000; 50 steel baggage cars, the American Car & Foundry Co., $950,000; 18 steel combination passenger and baggage cars, the Pressed Steel Car Co., $476,730; 28 cars for horses, $669,200; 2,000 steel box cars, the American Car & Foundry Co., $5,218,120; 1,000 steel auto-box cars, the Pressed Steel Car Co., $2,703,680; 500 refrigerator cars, the Merchants Despatch Transportation Co., $1,550,000; 5,000 steel hopper cars, the Standard Steel Car Co., $12,015,300; 4 U-2 eight-wheel switching locomotives, the American Locomotive Co., $159,247; 2 steel dining cars, the Pullman Co., $144,000; 50 steel suburban coaches, $1,325,000; 1,000 steel box cars, the American Car & Foundry Co., $2,617,110.

Big Four: 25 H-10 Mikado freight locomotives, the Lima Locomotive Works, $1,991,100; 10 passenger locomotives, $662,000; 20 U-3 eight-wheel switching locomotives, the Lima Locomotive Works, $736,380; 25 steel passenger coaches, the Standard Steel Car Co., $696,300; 10 steel baggage cars, the American Car & Foundry Co., $189,990; 10 steel baggage cars the American Car & Foundry Co., $213,360; 5 steel dining cars, the Pullman Co., $240,000; 6 steel combination passenger and baggage cars, the Pressed Steel Car Co., $132,560; 2,000 steel box cars, the American Car & Foundry Co., $5,239,040; 1,500 steel hopper cars, the Pressed Steel Car Co., $3,612,225; 500 steel hopper cars, the Standard Steel Co., $1,204,400; 500 refrigerator cars, the Merchants Despatch Transportation Co., $1,550,000.

Michigan Central: 15 H-10 Mikado freight locomotives the Lima Locomotive Works, $1,201,935; 5 passenger locomotives, $331,000; 5 U-3 eight-wheel switching locomotives, the American Locomotive Co., $184,590; 5 U-3 eight-wheel switching locomotives, the Lima Locomotive Works, $183,300; 15 steel passenger coaches, the Pullman Co., $417,465; 3 steel dining cars, the Pullman Co., $144,000; 20 steel baggage cars, the American Car & Foundry Co., $391,360; 1,000 steel box cars, the American Car & Foundry Co., $2,618,750; 1,000 steel auto-box cars, the Standard Steel Car Co., $2,711,780.

Cincinnati Northern: 250 steel underframe, double sheathed auto-box cars, the American Car & Foundry Co.

Notes of Washington Activities

By Paul Wooton

Freight cars with defective power brakes must be repaired at the first shop equipped to handle such work unless placed at the rear of cars whose power brakes are functioning and in the latter case constituting not more than 15 per cent of the train, the Supreme Court decided April 28 in response to a question of interpretation of the Safety Appliance Act propounded by the Third Circuit Court of Appeals.

The New York Central R.R. had appealed to the Circuit Court of Appeals from penalties assessed against it by the District Court in Western Pennsylvania for violation of the act. There were two similar cases. In a typical case, a train of 63 cars, all equipped with air brakes, left Ohio in proper condition. En route, the brakes on three cars became defective and were cut out. The train passed through Erie, where there are repair shops, without making repairs and proceeded to Buffalo. The cars with defective brakes were left in their original position in the train, the air lines through them being in working order and the engineer thus being able to control the train without trainmen using the hand brakes on the defective cars. The Circuit Court of Appeals asked the Supreme Court whether this was a violation of the Safety Appliance Act.

The opinion by Justice Butler explains the law as providing that cars without power brakes constituting not more than 15 per cent of the train may be used, but placed at the rear of the train. Cars with broken power brakes must also be thus assembled, the opinion held, if carried beyond the first repair shop.

More "Surplus" Property

A large additional amount of equipment which can be utilized in connection with highway construction will be made available for distribution to the states in the near future, it is believed. Recent congressional hearings have revealed the fact that the War Department's surplus of this equipment, particularly trucks, is much greater than should be carried. In certain instances, it has been revealed that inventories of such surplus property have been very inaccurate.

The reluctance with which the Army surrenders surplus equipment, even when it is evident that the property can have no further military application has resulted in no small amount of friction. Senator Capper, of Kansas, and Senator Norbeck, of North Dakota, in an effort to establish the number of trucks and their condition in storage at Camp Holabird, visited the camp. Their testimony and that of other members of Congress who visited this camp indicates that hundreds of trucks, many of which never have been removed from their original crates, have been allowed to deteriorate to the point where their re-conditioning would require more time than would be necessary to secure new trucks were the country to be suddenly involved in war.

A congressional delegation has conferred with the Secretary of War on the subject. He has promised to adopt vigorous measures to secure the immediate transfer of such material to the Bureau of Public Roads. In addition, a bill will be reported intended to require more accurate reporting of surpluses.

Have Confidence in Mr. Stone

Some clarification of the trade statistic situation is in prospect as a result of the change of attorney general. Mr. Daugherty gave this controversy very little personal attention, but he was willing to stand behind certain of his assistants who have assumed what is regarded both in and out of government circles as an unreasonable attitude. It is believed that the new Attorney-General will insist on determining this policy for himself. It is known positively that he has not given study to the subject, but he recognizes the importance of having some determination of the matter.

The same staff is on duty at the Department of Justice under the new Attorney General as was the case when Mr. Daugherty was in office. There is reason to believe, however, that Mr. Stone will not leave the determination of such important policies to subordinates. It is understood that he is acquainting himself thoroughly with the situation and is willing to take into careful consideration any suggestions which may be forthcoming from those who believe trade statistics are in the interest of the general public.

NOBODY'S FAULT BUT OUR OWN

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Folks who pay no attention to the selection of their seed—

WHY IS IT I NEVER GET ANYTHING BUT TURNIPS?
OUR GARDEN OF POLITICAL SERVANTS
CROP OF CONGRESSMEN CITY OFFICIALS & LEGISLATORS
J.N. DING

Needn't be surprised if they don't get what they want in their garden

J. N. Ding in the N. Y. Herald-Tribune

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance*, New York

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THE suspension of a rather important bank at El Paso, Texas, was about the only distinctly unfavorable news that business had to contend with last week. Following the bank failure reported from St. Paul ten days ago, the El Paso suspension has been vigorously exploited by the pessimists who seem to have overlooked the fact that both institutions were struggling with frozen loans that were made some years ago. Therefore their embarrassment is not to be regarded as symptomatic of existing conditions, although it is possible that they have been allowed to go to the wall because the ease of money makes the present an opportune time for the re-organization of crippled financial institutions.

Perhaps this may also explain the apparent insensibility of the markets to bad news. The stock exchange has been very dull, but where prices have moved at all they have improved. This is especially true of bonds, for which there has been an excellent demand at a gradually advancing level. This is fundamentally due to the cheapness of money. The call rate in New York is now 3½ per cent and time loans are to be readily had at 4 per cent.

None of the other Reserve Banks have as yet followed the example of the New York institution in reducing its rediscount rate, but the weekly statement of the Federal Reserve System seems to make lower rates inevitable for it shows a reserve ratio of 82.4 per cent and earning assets of only $838,000,000.

The retail trade of the country is holding up remarkably well. The bank clearings indicate an undiminished turnover of goods and, while the steel industry is below the peak of activity reached in March, it is still above what is regarded as normal.

Tin has had a substantial decline from which there has been a slight recovery. The movement seems to be entirely speculative. Supply and demand seem to have but little to do with it. The other non-ferrous metals have been easier in sympathy with tin but all offerings have been readily taken by the trade. Rubber is a shade easier on speculative selling from Singapore but the American stocks are relatively small and there is not much room for a decline.

The agricultural outlook is excellent and while it is too early to prognosticate the harvest it can at least be said that the promise is encouraging. It is therefore difficult to account for the minor note that is so often to be heard when business men foregather.

What's Doing in Industry

Better business to a limited degree is reported by machinery and machine tool dealers during the first ten days of May, nearly every part of the country noting this improvement. There are those who believe that this has no particular significance, while others feel that it is the beginning of a return to normal production and selling.

Construction has kept up well and figures show that this year will be an exceptional one in building. This means that someone is spending money, and lines dependent upon building all report good business. Woodworking machinery is in good demand and furniture factories report good production figures.

The automobile situation is somewhat clarified and the feeling is that while production will not be as great as at first figured, it will be exceptionally good and automobile makers will be buyers of machine tools during the remainder of the year.

Iron and steel production is reported down from the peak and prices may recede a little, it is said. Other metals find a dull and listless market.

Wall Street had a week quieter than usual but with prices resisting bear movements. Most brokers claim that this is the most opportune time to buy, which means that they have confidence in the future for a rising market.

General conditions are good, in spite of rumors, and the majority of business men feel that improvement is imminent.

Some one has suggested that the very placidity of present conditions may be depressing to those whose training has accustomed them to excitement as a characteristic of activity. This may be true, for there is but little excitement at present. The machinery of finance and commerce in the United States is functioning almost perfectly. Industrial efficiency is increasing. The railroads are in excellent condition and goods are being carried with unusual dispatch. Orders are filled promptly and the articles purchased are speedily delivered.

In the commercial world the lost motion has been reduced to a minimum. One result is that merchants are learning to carry small stocks and are content to buy from hand to mouth. In the final analysis this is desirable as it reduces the hazards of business and the capital investment required. It is, however, hard upon the manufacturer or original producer and he is complaining. It is natural that he should protest, but if he is wise he will try to adjust himself to the new conditions, for they are economically sound and have probably come to stay.

In Europe the week's developments have been somewhat reactionary. The German elections are described as inconclusive in so far as the acceptance of the Dawes plan is concerned. Another period of delay is therefore to be expected.

The political and industrial unsettlement reported in the Ruhr is probably a result of the indecisive German elections. An overdue decline in the franc and a re-action in sterling are also attributed to the same cause. They were, however, generally expected and predicted.

But the people of this country are becoming a bit weary of the vagaries of Europe and their influence on American affairs is gradually dwindling. The predicament of Cuba is in fact attracting more attention than that of Europe just now. That there is grave dissatisfaction with the Zayas administration seems to be clear and an armed attempt to overthrow the group at present in power is predicted unless our government intervenes as it has the right to. Just what the outcome will be is hard to say, but our commerce with Cuba is so large that it is impossible for us to disregard the recent developments there.

Except for the cloud over the Caribean Sea, the skies are clear and the prospect seems to justify a reasoned and a reasonable confidence in the future. Eddies that are due to overproduction or underconsumption are to be found here and there, but upon the whole the stream of American business is flowing smoothly.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Buffalo

There is a prevailing note of optimism in the Buffalo machinery market, quite unlike the slightly pessimistic tone that has prevailed for some weeks previous. Business is beginning to come in sufficient volume to warrant the dealers looking to the future with a degree of confidence. Although most of the orders reported are small and scattering they are of sufficient volume in some cases to beat the business that was on the books for the same period last year and generally up to normal for this time.

Radial drills, especially, seem to be holding their own. The Pierce-Arrow Motor Co. is reported to have bought fourteen radial drills during the past week.

Milling machines are selling occasionally and one firm reported the sale of three milling machines in Elmira last week. Lathes are not moving well in the Buffalo market, probably because of the large numbers of used lathes which have been put on the market recently through sale of the equipment of two or three large plants. Some used lathes were sold during the week. The American Radiator Co. is reported to have bought several grinders and radial drills within the fortnight. There is some inquiry for hydraulic presses.

Orders for road equipment are reported as considerably ahead of last spring in the Buffalo territory.

A few large locomotive cranes for contractors are being sold.

Cincinnati

The machine tool market in Cincinnati is in better condition than it was several weeks ago and there are signs of greater activity evident in the production of the various plants. While the industry is only operating at the present time on a part time basis, executives feel more encouraged than they did during April. Production records reveal that April output was on a par with that during March. The opening days of May have brought even better results and reports that have been made by some of the local plants show that they have orders on hand that will keep them busy until well into June.

The railroads are beginning to purchase machine tools now and local concerns have been bidding spiritedly to secure this business. Railroads have held off thus far this year and have been in the market only when necessity demanded, but they are expected to be a considerable factor in the business of Cincinnati machine tool houses throughout the rest of 1924, according to a number of leading executives. Some manufacturers do not feel so optimistic as this, however, and believe that the railroads will continue to exhibit extreme conservatism in their purchases of machine tools, thereby keeping the business of local machine tool plants from this source down to the minimum.

Auto Production Better

Reports from the automotive manufacturers indicate that they are beginning to widen their scale of operations and that they will be buying machine tools more extensively than they have. Business placed by the automotive manufacturers with Cincinnati concerns in the early part of May has been a decided improvement over that placed during April.

Orders for lathes have been fair in the past two weeks, but there is much room for improvement in this line. Milling machine sales likewise have been only fair, but inquiries have been good and manufacturers are anticipating the closing of considerable business in the near future. Planers have been selling well and production in this field is satisfactory. Drilling machinery has a rather quiet market, although here again there are definite signs of more activity. The used machinery market is showing strength, even though it is below last year's volume of business for the corresponding period. Woodworking machinery production goes ahead at a rapid rate while electrical tools are being manufactured on a satisfactory basis.

New York

Some little improvement during the first two weeks of May was noted in the machinery and machine tool markets in New York. Most dealers do not take this as any indication of better demand but merely as an accumulation of effort culminating during this period. One dealer stated that he had actually sold more tools during the first six business day of the month than during the entire 26 days of April, but he admitted that his salesmen had been working on most of the sales for some little time.

Railroads are only buying small orders and the lists are not out to the same number as during the first quarter of the year. The Southern Railway and the Norfolk and Western were in the market last week with several inquiries for tools and there was some closing on previous lists by the New York Central and the Erie.

Locomotive builders have been buying some replacement tools but this business is not exceptional. Manufacturers of electrical goods are proving to be good steady customers.

Used tools are in demand to a fair degree and dealers in these articles report a steady business of average proportions. There is some little difficulty in picking up desirable machine tools, it is said.

The Future

Prospects for improved business conditions in machinery and machine tools are not as bright as was expected. Most dealers are loath to place any definite date as the probable turning point while others are not anticipating anything except replacement orders until the fall. The more optimistic expect to see a betterment after the political conventions are concluded, but in what manner this change will be effected is not clear.

Cleveland

Turn of the month has brought a turn for the better in the machine tool situation as viewed in the Cleveland district. During the last week or ten days there has been a marked improvement in actual demand from many sources hitherto not heard from since the beginning of the year.

Perhaps the most encouraging phase is that inquiries that have been received for several months past now appear to be turning into orders. Moreover, the seasonal influence is being felt from various industries in need of additional equipment. The automotive industry which has held off significantly for this time of year, has at last come forward for automatic equipment. Pipe interests also are taking additional equipment applicable to that need. General manufacturing is showing a change for the better for all equipment, though much of this is lighter rather than the heavier descriptions.

It is equally significant that while this improvement is noted more in the West and Southeast territories, and at points farther West than the immediate Cleveland territory, the same stimulation is lacking for the moment in this vicinity.

Detroit

Announcement of several new models by some of the leading motor car manufacturers and a healthy trend toward increased production with the advent of good weather has featured the past week in automotive circles in Detroit and vicinity.

Machine tool and machinery men are reporting many inquiries, but the general tendency on the part of executives is to be cautious just at this time, it is said.

Leaders in the field declare that they have never heard such a wide variance of rumors prevailing in other cities

as to conditions in Detroit, and they are one in declaring their belief in the continued prosperity of this city and of the automobile industry that is centered here.

Demands for special machinery seem to be the order of the day just at present, with standard equipment finding a secondary place.

Increased buying on the part of railroads is anticipated within the next month.

Building figures for the first four months of the year, which are more than $5,000,000 above the corresponding period in Detroit's banner year, attest to the general business conditions which are excellent when viewed in the light of these figures, bank clearances, and employment figures.

Philadelphia

An increased production in many lines was noted throughout the industrial centers of Philadelphia in the last few weeks. Most of the shipyards along the Delaware River are devoting much of their efforts to the production of specially built machinery, both land and marine.

Among most of the producers the outlook was described as favorable, with some inquiries indicating that the optimism is justified. Manufacturers of electric power equipment say the outlook appears to be very good. Business in this line increased about 50 per cent last month compared to April of 1923. Outside equipment for central station plants appear to be in the greatest demand, manufacturers said.

Since the shipyards have turned their attention to machinery production most of them have been operating at from 60 to 70 per cent capacity, with the outlook encouraging for continuance of that ratio.

Automobile manufacturers are in the market for some new equipment.

Some demand has been noted for hoisting engines. Demand is strong from the building trade for four-cylinder gasoline engines for hoisting and mixing.

In spite of these activities there is still a tendency toward curtailment of production. The plant of the Baldwin Locomotive Works is operating at about 30 per cent capacity.

Dealers in this district anticipate improvement of a steady character within the next six weeks or two months.

No Shortage of Cars Reported

There is practically no car shortage reported throughout the entire country, according to reports filed with the Car Service Division of the American Railway Association.

Car repairs are progressing, so these reports showed, and on April 30 the railroads had 329,489 freight cars in good repair and ready to leave the shops. This was an increase of 7,657 over the number reported on April 22, when there were 321,832. Of the total 193,061 were surplus coal cars in good repair, an increase of 3,461 since April 22. There were also 101,648 surplus box cars, an increase of 2,762 within the same period.

Report Shows Benefits of Simplification

More progress was made in the first quarter of 1924 by industries seeking co-operation of the Division of Simplified Practice, Department of Commerce, in squeezing the waste out of industry, than in any like period since the Division was formed, says a report to Secretary of Commerce Hoover, who organized this division. Many of these industries have reported big gains in stabilizing employment, improving service to the consumer, increasing production at lower costs, both to the manufacturer and consumer, it is declared.

In addition to ten industries which the Division has aided in putting simplification of variety into force, twelve others are nearing the completition of such a program, states William A. Durgin, chief of the division. The Division of Simplified Practice, after having brought manufacturers, distributors, and consumer interests into conferences which have voted reduction of excess varieties, is now receiving the formal acceptances of the programs by individual interests.

The United States Chamber of Commerce, the American Engineering Standards Committee, the A. W. Shaw Co., all of which were active in simplifications necessitated by the pressure of war times, have co-operated in focusing attention of the manufacturing world on the advantages possible from the elimination of wasteful variety, says the report.

Effective July 1

July 1, the report indicates, will be an important date from the standpoint of simplification, as on this date programs will become effective in basic standards of sizes and weights in the paper industry, the lumber industry, forged tools, blackboard slate and roofing slate.

Other countries, the report shows, are watching the effect of the simplified practice movement, and of its impact on industry, seeing a possibility of more active competition from American manufacturers through increased output, smaller inventories and other economies.

Visitors to the Division from Japan, Czechoslovakia, France, Germany, and Great Britain have inquired into the simplified practice movement, how it is put into effect, and as to its progress and results. In addition, Norway and the Netherlands have written for similar information. Norway has instituted a three-year program of standardization of a large number of commodities.

Obituaries

Robert Kirkup, aged 92 years, founder of Robert Kirkup & Co., brass foundry, Cincinnati, is dead. Colonel Kirkup died as the result of injuries received when he fell down a flight of stairs in his foundry on Feb. 1.

Personals

L. Kattenburg, a director of R. S. Stokvis & Zonen, Holland, sailed from New York yesterday for Rotterdam after spending several weeks in this country. The New York office of the company is located in the Whitehall Building.

Joseph R. Frank, formerly sales engineer of the Thurston Manufacturing Co., Providence, R. I., has resigned to take over the presidency of Carter-Milchman & Frank, Inc., 98 Park Place, New York City.

E. H. Benner and R. W. Benner, representing the American Forge & Machine Co., Canton, Ohio, in the New York district, have moved their offices from 2 Rector St. to 30 Church St., New York City.

A. D. Heath has been appointed the representative for the Joyce-Koebel Diamond Co., Inc., New York City, in the states of Indiana, Illinois and Missouri with headquarters in the Merchants Bank Building, Indianapolis, Ind.

R. H. Grant, formerly president and general manager of the Delco Light Co., of Dayton, Ohio, a subsidiary of the General Motors Corp., has been appointed vice-president and general sales manager of the Chevrolet Motor Co.

C. J. Whitacre has been appointed chief engineer of the Flint Motor Co., of Flint, Mich. He was formerly with the Chevrolet, Mason Motor, Sampson Tractor, and General Motors.

Otto E. Stoll, for the past several years vice-president of the General Motors Truck Co., has been appointed general manager of the company's plant at Pontiac, Mich.

Edmund J. Fitzmaurice and George L. Beam, consulting engineers of Philadelphia, have been selected to represent the Philadelphia branch of the American Association of Engineers at its convention in San Francisco, June 11 to 13.

Samuel M. Vauclain, president of the Baldwin Locomotive Works, left this week on a business trip to Mexico.

J. J. Jordan is the general manager of sales of the newly opened office of the Apex Steel Co., Inc., at 270 Madison Ave., New York. The plant of the company is located at 59-63 Kramer St., Brooklyn.

M. L. Pulcher, who has been vice-president and general manager of the Federal Motor Truck Co., since its establishment fourteen years ago, was elected president and also general manager at the recent annual meeting of the stockholders.

Frank E. McAllister, vice-president and general sales manager of the Kalamazoo Railway Supply Co., Kalamazoo, Mich., has been elected president and general manager, succeeding the late John McKinnon.

Business Items

The Barney & Smith Co., Dayton, Ohio, will be offered again at auction in June. This company's plant has been re-appraised at a valuation in excess of $900,000, and may be sold if a bid of approximately $650,000 is made.

The Marshall & Huschart Machinery Co., 17 S. Jefferson St., Chicago, Ill., has been appointed representative for the Oilgear Co., Milwaukee, Wis., in the Chicago territory.

By the purchase of the J. C. Wilson Manufacturing Co., Belleville, Canada, the Carthage Machine Co., Carthage, N. Y., has established a branch in the Canadian city. A. K. Hinds, general manager of the Carthage Machine Co., will be the president of the new Canadian company. F. S. Wilson of the old Wilson company will be the vice-president.

The John Steptoe Co., Cincinnati, Ohio, is now manufacturing a line of portable electric tools.

The Eastern Cutter & Salvage Corp., 13 Kirk Place, Newark, N. J., will move to its new quarters, 37 Treman St., June 1.

The Borgeson Tool & Machine Co., Inc., Syracuse, N. Y., has moved to 318-324 Pearl St.

Charles Gordon, Inc., has been appointed the Wisconsin and Minnesota representative for the Joyce-Koebel Diamond Co., New York City.

The American Bronze Corp., Berwyn, Pa., has been removed from receivership and henceforth will operate as a corporation with the following directorate: Philip E. Guckes, George M. Huey, William F. Fischer, S. B. Rheam and E. G. Anderson. The officers elected are: E. G. Anderson, president; William E. Fischer, vice-president; G. Willard Frame, treasurer; and John C. Smith, secretary.

The Aircool Spark Plug Corporation, formed with $300,000 capital at Miami, Fla., the latter part of April, contemplates the early establishment of a plant for the manufacture of a recently invented spark plug, and other automotive accessories. P. S. Campbell, of Miami, is president.

The Connecticut Cutter and Machine Works, 50 Remer St., Bridgeport, Conn., has been incorporated with the following officers: Samuel Glover, president and treasurer; H. W. Glover, vice-president; Carl Foster, secretary. H. F. Noyes continues as general manager.

More Space Needed for Steel Exposition

Additional space has been secured for the exposition to be held in conjunction with the convention of the American Society for Steel Treating at Boston, Sept. 22, 23, 24, 25 and 26. Besides the original space contracted for on Commonwealth Pier, space to allow fifty more exhibits has been added. The additional space will be devoted to machine tool exhibits exclusively.

The George Richards Fund

The London correspondent of the *American Machinist* has been asked to place before American readers the position of the George Richards fund, the purpose of which is to secure the welfare and education of the younger son of George Richards, the well-known machine tool man who died about a year ago, and who, though working in Europe for many years, never gave up his American citizenship. The Machine Tool Trades Association voted £100 towards the fund, and members and others have promised subscriptions amounting to rather more than £100 per annum. The sum required is £150 per annum for three years, and it is thought that there are many persons in the United States who would be willing to help in providing the £50 or so per annum still needed. Contributions will be received with gratitude by the executive committee of the George Richards Fund, the Machine Tool Trades Association, 70 Victoria St., London, S. W.

Trade Catalogs

Polishing Lathes. The Gardner Machine Co., Beloit, Wis. This catalog describes thoroughly the Gardner ball bearing polishing lathes. There are many illustrations showing the various types made and diagramed drawings clearly pointing out the advantages claimed for these lathes.

Disc Grinders. The Gardner Machine Co., Beloit, Wis. The Gardner No. 27 double-spindle disc grinder is described in a catalog recently issued. This catalog is perforated on the left side for filing. Methods of use and advantages to be gained by the operation of these tools are outlined.

Hydraulic Riveter. The Oilgear Co., Milwaukee, Wis. Looseleaf pages suitable for filing on the subject of hydraulic riveters, bench presses, and variable delivery pumps made by the Oilgear company have been mailed out to the industry. The pages contain illustrations of the product, short description and specifications.

Casting Alloys. The Calorizing Co., Pittsburgh, Pa. This booklet which deals with the subject of alloys suitable for the production of castings exposed to temperatures as high as 2,100 deg. F. is exceptionally attractive. Illustrations showing the work done and text that describes the virtues of Calite, the company's product, combine to make the booklet complete.

Gages. The Greenfield Tap & Die Corp., Greenfield, Mass. This is catalog No. 47 and contains a complete classification of the innumerable gages made by this corporation. In addition to these descriptions are to be found tables and miscellaneous gage and thread information. The booklet forms an excellent reference book as well as catalog.

Metal Coating Process. The Metals Coating Co. of America, 495-497 North Third St., Philadelphia, Pa. A catalog showing the Schoop process of metal spraying in various industries. The company's product is known as MetaLayeR and is thoroughly described in this publication. Copies will be sent on request.

Electro-Magnetic Furnaces. The Automatic & Electric Furnaces, Ltd., 173-175 Farrington Road, E. C. 1, London, England. This booklet tells of the Wild-Barfield system for the automatic hardening of steel. It is well illustrated and contains many charts and tables of specifications.

Una-Flow Engines. Mesta Machine Co., Pittsburgh, Pa. A folder setting forth the advantages of the Mesta uni-flow engines and the result of recent tests has just been mailed out. Several of the machines are shown by photograph.

Lacquer. The Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. This is Bulletin No. 8 describing Hilo crystallizing lacquer which is used in the metal finishing trade.

Thread Lead Indicators. The Bicknell-Thomas Co., Greenfield, Mass. A folder has been issued by this company in which is shown the method used in determining accuracy of threads. The indicator is so designed that it can be used for either external or internal threads.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Conveyors for handling shingles, sand, etc., portable belt type. Auckland, New Zealand. Exclusive agency. Reference No. 9972.

Machine shop equipment. Palembang, Sumatra. Purchase. Reference No. 9964.

Machinery for making automobile hoods. Glasgow, Scotland. Agency. Reference No. 9965.

Machinery and machine tools. Lausanne, Switzerland. Agency. Reference No. 9963.

Forthcoming Meetings

American Society of Mechanical Engineers. Spring meeting. Cleveland, Ohio. May 26, 27, 28 and 29. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association. Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

National Association of Purchasing Agents. Annual Convention, Mechanics Hall, Boston, May 20, 21, 22 and 23. W. L. Chandler, secretary, 19 Park Place, New York City.

Foreign Trade Council. Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

Gas Products Association. Tenth annual meeting. June 10, 11 and 12. Ambassador Hotel, Atlantic City, N. J. C. T. Price, secretary and treasurer, 140 S. Dearborn St., Chicago, Ill.

The General Committee of Division V, Mechanical of the American Railway Association. Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

Railway Supply Manufacturers Association. Exhibit. Atlantic City, June 11-18, 1924.

American Society for Testing Materials. Twenty-seventh annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Week of June 23. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. Summer Meeting. June 24, 25, 26 and 27. Spring Lake, N. J. C. F. Clarkson, secretary, 29 W. 39th St., New York City.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Foundrymen's Association. Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

Management Week. Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Increase in number of pig-iron inquiries. Price of No. 2 f'd'y, Southern, firm at $22@$23 per ton, Birmingham. Steel prices are firming at present levels, owing to nearness of sales quotations to cost of production. Bars are firmest at $2.25@$2.40 per 100 lb., Pittsburgh; shapes, next at $2.10@$2.35 and plates, third at $2.10@$2.30 per 100 lb. Structurals comprise bulk of tonnage now being sold.

Non-Ferrous Metals—Electrolytic copper unchanged since May 2; less metal available than year ago; all other non-ferrous metals down. Premiums offered on spot tin shipments. Lead buying slow; no surplus stocks of metal. Zinc and antimony weak. Published quotations on old metals nominal, owing to unsettled condition of metals' market.

Linseed Oil rising again after recent slump. Raw oil, 5 bbl. lots, 98c. per gal., f.o.b. New York, against 95c., May 2.

(All prices as of May 9)

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	22@23
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	$2.85@3.00	4.34	3.65	4.00
No. 12	2.95@3.10	4.39	3.70	4.05
No. 14	3.05@3.20	4.44	3.75	4.10
No. 16	3.25@3.40	4.54	3.85	4.20
Black				
Nos. 17 and 21	3.70	4.65	4.35	4.55
Nos. 22 and 24	3.75	4.70	4.40	4.55
Nos. 25 and 26	3.80	4.75	4.45	4.60
No. 28	3.85	4.85	4.55	4.70
Galvanized				
Nos. 10 and 11	3.80@4.00	4.90	....	4.60
Nos. 12 and 14	3.90@5.10	5.00	....	4.70
Nos. 17 and 21	4.20@4.40	5.30	....	5.00
Nos. 22 and 24	4.35@4.55	5.45	5.10	5.15
No. 26	4.50@4.70	5.55	5.35	5.30
No. 28	4.80@5.00	5.85	5.65	5.60

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv
1 to 3 in. steel butt welded.	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded.	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%, less 5%; class A, plus 23%. Cast iron, standard sizes, 34@5% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
¼	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.40
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	4.10	4.00
Cold drawn flats, squares	4.90	4.60	4.50
Structural shapes (base)	3.59	3.46	3.30
Soft steel bars (base)	3.49	3.36	3.20
Soft steel bar shapes (base)	3.49	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.59	3.46	3.30
Bar iron (3.00 at mill)	3.49	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	60%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.87½
Tin, 5-ton lots, New York			47.75
Lead (up to carlots), St. Louis	7.15	New York	8.00
Zinc (up to carlots), St. Louis	5.75	New York	6.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.00	30.00	28.50
Antimony (Chinese), ton spot	9.00	11.50	10.00
Copper sheets, base	20.75	20.75@21.00	23.00
Copper wire, base	16.00	18.75	16.25
Copper bars, base	19.75	22.00	19.50
Copper tubing, base	22.75	27.00	23.00
Brass sheets, base	17.25	21.50	18.75
Brass tubing, base	21.50	26.50	20.50
Brass rods, base	15.00	17.50	15.75
Brass wire, base	17.75	21.50	....
Zinc sheets (casks)	10.75	11.00	....
Solder (½ and ½), (case lots)	37.00	34.50	30.00
Babbitt metal (83% tin)	60.00	60.00	48@52
Babbitt metal (35% tin)	28.00	19.50	23@26
Nickel (ingot and shot) f.o.b. refinery	27.00	....	....
Nickel (electrolytic) f.o.b. refinery	30.00	....	35.00
Nickel (F shot) f.o.b. refinery	30.00	....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Shop Materials and Supplies

METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54. 00
Manganese nickel hot rolled rods "D"—high manganese (base) 57. 00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32. 00	Hot rolled rods (base)	40. 00
Blocks	32. 00	Cold drawn rods (base)	48. 00
Ingots	38. 00	Hot rolled sheets (base)	42. 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00@10. 75	10. 50	10. 75
Copper, heavy, and wire	9. 62½@10. 50	10. 00	10. 00
Copper, light, and bottoms	7. 62½@9. 50	8. 50	9. 00
Lead, heavy	5. 75 @7. 50	6. 00	6. 50
Lead, tea	3. 25 @6. 25	3. 50	5. 50
Brass, heavy, yellow	4. 87½@6. 75		6. 50
Brass, heavy, red	7. 12½@9. 00	9. 00	8. 50
Brass, light	4. 12½@5. 75	5. 00	6. 00
No. 1 yellow brass turnings	4. 12½@6. 75	6. 00	6. 50
Zinc	3. 12½@3. 75	3. 50	3. 50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$24. 30	$22. 85	$18. 50
"A" Grade:				
IC,	20x28, 112 sheets	20. 20	18. 00	17. 00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14. 00	13. 00	14. 50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8. 25	6. 55	7. 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 14@0. 21	$0. 20	$0. 14
Cotton waste, colored, per lb.	. 09@ .12½	.17	. 10½
Wiping cloths, 13¼x13¼, per lb	11. 75	36. 00 per M	. 16
Wiping cloths, 13¼x20½, per lb.	....	52. 00 per M	. 16
Sal soda, per 100 lb.	2. 40	2. 25	2. 65
Roll sulphur, per 100 lb.	3. 60	3. 50	3. 50
Linseed oil, per gal., 5 bbl. lots	. 98	1. 02	. 94
Lard cutting oil, 25% lard, per gal.	. 55	50	. 79*
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	. 35	. 40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber and duck:			
First grade	50%	50–10%	40–10%
Second grade	50–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5. 40	$5. 84	$6. 48
Emery paper	9. 90	11. 00	8. 80
Emery cloth	31. 12	31. 12	29. 48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1. 49	1. 24	1. 40
Cloth	3. 38	2. 67	3 20
Fire clay, per 100 lb. bag		. 65	. 60
Coke, prompt furnace, Connellsville	per net ton		3. 75@4. 00
Coke, prompt foundry, Connellsville	per net ton		4. 75@5. 50
White lead, dry or in oil	100 lb. kegs		New York, 15. 00
Red lead, dry	100 lb. kegs		New York, 15. 00
Red lead, in oil	100 lb. kegs		New York, 16. 50

*Chicago quotes on pure lard oil, No. 1 grade.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0. 0349	$0. 0354	$0 0334
Cold finished shafting	per lb.	0. 044	0. 044	0. 042
Brass rods	per lb	0. 15	0. 16	0. 20
Solder (½ and ½)	per lb.	0. 37	0. 39	0. 331
Cotton waste	per lb.	.14@. 21	.14@. 21	.10@. 13
Washers, cast iron (½ in.)	per 100 lb.	6. 50	6. 50	6. 00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3. 38	3. 38	3. 02
Lard cutting oil	per gal.	0. 55	0. 55	0. 55
Machine oil	per gal.	0. 29	0. 29	0. 297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	45%	45%	40%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60–10–5%	55–5%
1½ and 1½x3 in. up to 12 in	15%	60%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	30%	$3. 50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3. 50 net	$4. 00 off
Button head bolts, with hex. nuts	List net	List net	3. 50
Hex. head and hex. nut bolts	List net	.....	List plus 10%
Lag screws, coach screws	45%	.....	50–5%
Square and hex. head cap screws	75%	75%	75–5%
Carriage bolts, up to 1 in.x30 in.	35%	60%	50–5%
Bolt ends, with hot pressed nuts	45%	.....	55–5%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, 9/16 and smaller	65%	.....	.....
Semi-finished nuts, ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6. 50	$4. 00	$4. 00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5. 50	4. 00	4. 00
Washers, round plate, per 100 lb. Off list	1. 50	4. 50	4. 00
Nuts, hot pressed, sq., per 100 lb. Off list	1. 00	4. 00	3. 50
Nuts, hot pressed, hex., per 100 lb. Off list	1. 00	4 00	3. 50
Nuts, cold punched, sq., per 100 lb. Off list	1. 00	4. 00	3. 50
Nuts, cold punched, hex., per 100 lb. Off list	1. 00	4. 00	3. 50
Rivets:			
Rivets, 7/16 in. dia. and smaller.	50%	60–10%	60%
Rivets, tinned	50%	60–10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5. 00	$3. 50	$3. 75
Cone heads, ditto (net)	5. 20	3. 60	3. 95
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0. 25	.....	0. 15
⅝ in. diameter *EXTRA*	0. 35	.....	0. 15
½ in. diameter *EXTRA*	0. 75	.....	0. 50
1 in. long, and shorter *EXTRA*	0. 75	.....	0. 50
Longer than 5 in. *EXTRA*	0. 50	.....	0. 25
Less than 200 lb. *EXTRA*	0. 50	.....	0. 50
Countersunk heads *EXTRA*	0. 45	.....	$4. 20 base

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Mass., Arlington (Boston P. O.)—Town —metal working equipment.

Mass., East Boston (Boston P. O.)—A. Storlazzi, 3 Lamson St.—equipment for proposed automobile repair shop, later.

Mass., Medford—H. H. Staples—general equipment for proposed machine shop.

Mass., Milford—W. J. Collins Fdry. Co. —equipment for proposed foundry, later.

Mich., Detroit—Vince Tool Co., 407 East Fort St.—shaper.

Mo., St. Louis—Mesker Bros. Iron Co., 421 South 6th St.—brake, 9 ft. 6 in. between housings.

O., Columbus — Columbus Bolt Wks., Water and Chestnut Sts.—lathes, grinders, milling and boring machines, later.

Tex., Corsicana — Clopton Planing Mill Co.—machinery for planing mill.

Tex., Dallas — J. F. Farrell, 105 South Houston St.—small wood turning lathe.

Tex., Dallas — Standard Spring & Axle Co., Commerce and Duncan Sts.—machinery for proposed factory for the manufacture of vehicle springs.

W. Va., Huntington — A. C. Love Co., 1123 4th Ave.—36 in. bandsaw.

Wis., Appleton — Appleton Constr. Co., 100 East Bway.—one loading crane.

Wis., Milwaukee—F. L. Goethel, 489 12th St. (sheet metal)—brakes, benders and rolls.

Wis., Milwaukee — Natl. Blow Pipe & Ventilating Co., 489 12th St.—sheet metal working machinery.

Wis., Milwaukee — Retailers Tallow & Calf Skin Assn., c/o J. Herman, 2322 State St.—conveyors, etc., for proposed $60,000 rendering plant.

Wis., New Richmond—New Richmond Roller Mills, W. Grover, Mgr.—conveying machinery.

Wis., Oconto — Holt Hardwood Co. — planers, saws, etc., for proposed planing mill, to replace fire loss.

Wis., Osseo—Osseo Canning Co.—conveying machinery.

Wis., Racine—Racine Sheet Metal Wks., 306 7th St.—sheet metal working machinery, including brake and beader.

Wis., Two Rivers—Becker Mfg. Co., M. Becker, Secy.—furnaces, etc., for proposed foundry.

Wis., West Allis—T. Kusljan, 5008 Natl. Ave.—woodworking machinery, including saws and planer.

B. C., Port Alberni—Spratt & Co., C. J. V. Spratt, Purch. Agt.—complete sawmill equipment.

B. C., Vancouver — Dowling Furniture Co., 226 2nd Ave., T. E. Dowling, Purch. Agt. — woodworking equipment for new factory.

Ont., Orillia — Canada Wood Specialty Co. — woodworking equipment and machines for the manufacture of woodenware, electric power.

Que., Escuminac — Escuminac Lumber Co., Ltd., S. Douglas, Secy. — complete equipment for new planing mill and sawmill, 10,000,000 ft. capacity.

Opportunities for Future Business

Ark., Little Rock—The Five Fifty-Five Tire Service Co., 223 Bway., awarded the contract for the construction of a 3 story, 140 x 150 ft. automobile service building. Estimated cost $150,000. Noted Apr. 17.

Calif., Oakland—The Aluminum Cooking Utensil Co., c/o K. E. Parker Co., Contrs., 519 California St., San Francisco, awarded the contract for the construction of a factory on 46th St., here. Estimated cost $97,625.

Calif., Oakland—The New Metal Products Co., c/o E. B. Field Co., 301 13th St., awarded the contract for the construction of a 1 story, 100 x 100 ft. factory for the manufacture of range boilers, water heaters, shells for automatic heaters, well casing, irrigation pipe and compressed air tanks, on 59th and Doyle Sts. Cost will exceed $40,000.

Calif., Stockton — The Western Pacific R.R. Co., Mills Bldg., San Francisco, awarded the contract for the construction of shops, etc., for terminal, here.

Ill., Chicago — The Illinois Tool Wks., 154 West Erie St., awarded the contract for the construction of a 1 story, 240 x 240 ft. factory at 2501-09 North Keeler St. Estimated cost $125,000. Noted May 8.

Kan., Leavenworth—The United States Penitentiary is having preliminary plans prepared for the construction of a 2 story, 50 x 150 ft. shops and warehouse building. Estimated cost $200,000. Supervising Architect, Treasury Dept., Wash., D. C.

Mass., Boston—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of plumbers supplies, is having plans prepared for the construction of a 6 story, 80 x 200 ft. factory and warehouse on C St., here. Estimated cost $150,000. French & Hubbard, 210 South St., Engr.

Mass., East Boston (Boston P. O.)—A. Storlazzi, 3 Lamson St., is having plans prepared for the construction of a 1 story, 40 x 50 ft. automobile repair shop on Bennington St. Private plans.

Mass., Medford—H. H. Staples awarded the contract for the construction of a 1 story, 45 x 60 ft. machine shop, etc.

Mass., Milford—The W. J. Collins Fdry. Co. awarded the contract for the construction of a 55 x 60 ft. foundry with 15 x 30 ft. wing, for the manufacture of iron and other metal castings. Noted Nov. 1.

Mo., Kansas City—The American Can Co., 120 Bway., New York, will build an addition to its plant, here. Estimated cost $500,000.

Mo., St. Louis—The Commodore Garage Co., c/o W. L. Allen, 615 Chestnut St., awarded the contract for the construction of a 3 story garage on 7th and Franklin Sts. Estimated cost $200,000.

N. J., Jersey City—The Boynton Furnace Co., Pacific Ave., Jersey City, awarded the contract for the construction of a 1 story foundry, to contain 40,000 sq.ft. of floor space. Estimated cost $150,000.

N. Y., Coney Island (Brooklyn P. O.)— The Transit Comn., 49 Lafayette St., New York, awarded the contract for the foundation of electrical repair shop, here. Noted Apr. 17.

N. Y., New York—W. A. Cameron, c/o S. J. Kessler, Engr. and Archt., 529 Courtlandt Ave., will soon receive bids for the construction of a 5 story garage on East 182nd St. Estimated cost $350,000.

N. Y., Port Chester—The Russell, Bursall & Ward Bolt & Nut Co., South St., awarded the contract for the construction of a 2 story, 60 x 340 ft. plant.

O., Cleveland — Peck, Stowe & Wilcox Co., 2176 West 3rd St., manufacturer of mechanics tools, awarded the contract for the construction of a 1 story, 50 x 108 ft., and 3 story, 66 x 100 ft. factory and forge shop. Estimated cost $100,000.

O., Cleveland—The White Motor Co., 842 East 79th St., awarded the contract for the construction of a 2 story, 150 x 160 ft. factory at 825 East 79th St. Estimated cost $200,000. W. C. White, Pres. Noted Apr. 17.

O., Columbus—The Columbus Bolt Wks., Water and Chestnut Sts., is having plans prepared and will soon receive bids for the construction of a 3 story, 100 x 240 ft. plant, 1 story, 50 x 300 ft. forge shop, 50 x 167 ft. storage shed and 50 x 167 ft. hot bolt shop. Estimated cost $350,000. Lockwood, Greene & Co., Hanna Bldg., Cleveland, Engrs. and Archts.

O., Hamilton — The Ford Motor Co., Highland Park (Detroit P. O.), Mich., is having plans prepared for the construction of a 1 story, 102 x 201 ft. addition to forge shop on 4th St., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Pa., Cheswick—The Hall Pump & Compressor Co., 213 Galveston Ave., N. S., Pittsburgh, awarded the contract for the construction of a 1 story, 60 x 160 ft. machine shop, here. Estimated cost $75,000.

Pa., Harrisburg—The Air Reduction Co., 342 Madison Ave., New York, manufacturer of acetylene welding apparatus, etc., awarded the contract for the construction of a plant, here. Estimated cost $300,000.

Pa., McDonald—The Genl. Fdry. & Machine Co. Peoples Bank Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 60 x 75 ft. foundry, here. Private plans.

Pa., Monaca—The Superior Steel Co., c/o M. P. Simpson, 413 3rd Ave., New Brighton, will build two 1 story, 60 x 100 ft. and 60 x 200 ft. factory buildings, here

Pa., Sharon—The Natl. Malleable & Steel Casting Co., Quincy St. and Woodhull Rd., Cleveland, O., is receiving bids for the construction of a 3 story machine shop and service building on South Dock St., here. Estimated cost $200,000. Private plans.

Pa., Upper Darby (Phila. P. O.)—The Kinetic Eng. Co., 60th and Baltimore Sts., Phila., manufacturer of organ blowers, etc., will soon award the contract for the construction of a 1 and 2 story, 60 x 140 ft. factory on Union Ave., here. Estimated cost $30,000. S. W. Marshall, 1524 Chestnut St., Phila., Engr.

Tex., Corsicana — The Clopton Planing Mill Co. plans to build a 2 story, 100 x 125 ft. planing mill on East 4th St. Estimated cost $50,000. Engineer or architect not announced.

Tex., Dallas — The Standard Spring & Axle Co., Commerce and Duncan Sts., plans to build a factory. Estimated cost $50,000.

Wis., Milwaukee—The Natl. Blow Pipe & Ventilating Co., 489 12th St., plans to build a 1 story, 60 x 122 ft. factory on 1st St. Estimated cost $50,000. Engineer or architect not selected.

Wis., Oconto—The Holt Hardwood Co., manufacturer of hardwood flooring, plans to rebuild its 2 story planing mill, etc., which was destroyed by fire. Engineer or architect not selected.

Wis., Two Rivers—The Becker Mfg. Co. will build a 1 story, 54 x 112 ft. foundry. Estimated cost $40,000. M. Becker, Secy.

Wis., Wausau—The Marathon Electric Mfg. Co., Plumer Island, awarded the contract for the construction of a 1 story, 52 x 116 ft. factory. Estimated cost $40,000. Noted May 8.

Ont., Orillia — The Canada Wood Specialty Co. is having plans prepared for the construction of a 2 story, 50 x 80 ft. factory. Estimated cost $75,000. E. Webb & Son, Orillia, Archts.